

**STUDY OF THE EFFECTS OF SIZE AND COMPLEXITY OF FINANCIAL
INSTITUTIONS ON CAPITAL MARKET EFFICIENCY AND ECONOMIC GROWTH
CARRIED OUT AT THE DIRECTION OF THE CHAIRPERSON OF THE
FINANCIAL STABILITY OVERSIGHT COUNCIL**

**ISSUED PURSUANT TO SECTION 123 OF THE
DODD-FRANK WALL STREET REFORM AND CONSUMER PROTECTION ACT**

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I. OVERVIEW

Section 123 of the Dodd-Frank Wall Street Reform and Consumer Protection Act (Pub. L. 111-203) (the “Dodd-Frank Act”) requires the Chairperson of the Financial Stability Oversight Council (the “Council”) to carry out a study of the economic impact of possible financial services regulatory limitations intended to reduce risks to financial stability and to make recommendations regarding the optimal structure of any limits considered. This report has been prepared in response to this mandate.

Section II of this report addresses each of the topics identified in section 123. Section II.A discusses explicit or implicit limits on the maximum size of banks, bank holding companies, and other large financial institutions. Section II.B discusses limits on the organizational complexity and diversification of large financial institutions. Section II.C discusses requirements for operational separation between business units of large financial institutions in order to expedite resolution in case of failure. Section II.D discusses limits on risk transfer between business units of large financial institutions. Section II.E discusses requirements to carry contingent capital or similar mechanisms. Section II.F discusses limits on commingling of commercial and financial activities by large financial institutions. Section II.G discusses segregation requirements between traditional financial activities and trading or other high-risk operations in large financial institutions. Finally, Section II.H discusses stress tests and capital and liquidity requirements as other limitations on the activities or structure of large financial institutions that may be useful to limit risks to financial stability.

Section 123 of the Dodd-Frank Act calls for a report to be issued every five years. This report updates the inaugural 2011 report and addresses the literature published over the last five years as well as the regulatory developments and implementation of the Dodd-Frank Act. The remainder of this overview section reproduces portions of the introduction and historical background sections of the 2011 report with updates as relevant, as these continue to provide context for the developments and the types of costs and benefits of financial regulation discussed in this report.

Introduction

A healthy financial system is essential to economic growth and stability. By mobilizing savings and channeling funds to borrowers, the financial system promotes investment in plant and equipment, new technologies, human capital, and housing. Banking institutions (including commercial banks, credit unions, savings associations, bank holding companies, and savings and loan holding companies, together referred to as “banks”) perform two special roles in the financial system. First, they engage in maturity and liquidity transformation by investing in long-term, illiquid assets created by borrowers and issuing short-term, liquid liabilities to investors. Second, they extend credit, using their expertise in screening credit risk *ex ante* and monitoring borrower behavior *ex post* to help direct funds to the highest valued uses.

Because of the importance of banks and other financial institutions (including securities firms, investment banks, and other financial intermediaries) in facilitating credit flows, adverse shocks to these firms can have an outsized impact on the overall economy. Insolvencies of banks and other financial institutions, and investor panic triggered by insolvency concerns, were important causes of the 2007 to 2009 recession; a similar dynamic also contributed to the Great Depression. These crises also showed the risks posed by under-regulated financial systems. Maturity transformation, by its nature, exposes banks to credit risk and liquidity risk. Even in the absence of regulation, investors have incentives to monitor bank behavior and withdraw funds from institutions that are viewed as too risky. This market discipline encourages banks to limit risk and to hold adequate buffers of capital and liquid assets. But from a public policy perspective, unregulated banks tend to carry too much risk because they do not internalize the costs that their distress imposes on the financial system. For example, if one bank is forced to sell a significant amount of illiquid assets quickly, other banks holding similar assets will experience mark-to-market balance sheet losses. And the failure of one bank can trigger investor concerns about the solvency of other banks that hold similar assets or are counterparties to the failed institution. Such concerns can trigger runs and pose a threat to financial stability. Banks do not have a market incentive to incorporate these external costs when weighing the marginal benefits and costs *ex ante* of holding additional capital or liquidity.

The need to mitigate risks to financial stability is a compelling rationale for financial regulation. Public credit guarantees and liquidity provisioning—such as deposit insurance and access to the discount window—are essential backstops for preventing bank runs. However, by reducing banks' downside risk, such backstops can reduce the incentive of investors to monitor bank behavior. Public backstops must thus be accompanied by regulations, such as limits on activities and minimum capital requirements that are designed to reduce excessive risk-taking.

Financial regulation must strive to limit excessive risk while not hindering efficient financial intermediation. There are two main channels through which financial regulation can affect the economy. First, regulations can affect the supply and cost of credit. Regulation affects credit supply in part through its effect on allocative efficiency. Ideally, the financial system should equalize the marginal social benefit of credit across different borrowers and should equalize the marginal benefit of credit to its social marginal cost. Financial regulation can promote allocative efficiency by narrowing differences between marginal costs and marginal benefits, but it can also exacerbate such differences. Promoting allocative efficiency does not always reduce the cost of credit. If credit is priced below its social cost, regulation should aim to raise the price of credit. Regulation can also affect credit supply through its impact on technological efficiency. Regulations that prevent innovation or preclude banks and other financial institutions from achieving economies of scale or scope may increase the cost of credit.

Second, financial regulation can affect the riskiness of individual banks and other financial institutions and the resilience of the financial system as a whole. Banks and other financial institutions may take on too much risk if they are not required to account for costs imposed on

other institutions in the event of distress, and this tendency is magnified to the extent that public backstops reduce market discipline. Reducing default risk reduces the expected cost of resolutions and benefits the economy by making financial crises less likely. Therefore, regulations that reduce excessive risk can benefit the economy and enhance financial stability. However, poorly designed regulations may unintentionally increase risks to financial institutions or reduce the resilience of the financial system.

A Brief Historical Background

The U.S. financial system has been subject to varying levels of regulation over time. The National Bank Act of 1863 generally limited the types of activities that could be conducted by national banks to those that are part of, or incidental to, the business of banking. The McFadden Act (1927) limited interstate branch banking, implicitly limiting bank size and geographic diversification. The Banking Act of 1933 (known as Glass-Steagall) separated commercial banks from investment banks. Commercial banks could not underwrite securities, while securities firms could not engage in commercial banking. The Bank Holding Company Act of 1956 prohibited banks from affiliating with companies engaged in commercial activities.

However, beginning in the late 1960s, economic and technological innovation and deregulation gradually eroded these restrictions. Commercial banks lost market share to new financial instruments and institutions such as commercial paper and money market mutual funds. In response, banks were allowed to expand and diversify their activities. The Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 (the “Riegle-Neal Act”) significantly eased interstate banking restrictions. The Gramm-Leach-Bliley Act of 1999 expanded the range of financial activities that may be conducted by qualifying banking organizations.

The early 2000s saw the rise of large, complex banks and other financial institutions engaged in a broad spectrum of financial activities, as well as the rise of a new model of financial intermediation, often referred to as shadow banking, in which maturity transformation increasingly took place outside the formal banking sector. In this new model, illiquid and (sometimes) risky assets were funded by asset-backed commercial paper or loans financed by repurchase agreements collateralized with asset-backed securities; credit and liquidity backstops of liabilities were implicit rather than explicit; and capital requirements and other restrictions were less stringent.

Inadequate regulation of this evolving financial system played a major role in the 2007 to 2009 financial crisis. The Dodd-Frank Act strengthens the regulatory system to address these developments. It established the Council, which is responsible for identifying risks to financial stability, promoting market discipline, and responding to emerging threats to the stability of the U.S. financial system. As one of its authorities, the Council may determine that a nonbank financial company shall be supervised by the Board of Governors of the Federal Reserve System (“Federal Reserve”) and shall be subject to prudential standards if the Council determines that material financial distress at the nonbank financial company, or the nature, scope, size, scale,

concentration, interconnectedness, or mix of the activities of the nonbank financial company, could pose a threat to the financial stability of the United States. The Dodd-Frank Act also provides for the establishment of enhanced prudential standards for bank holding companies with assets of \$50 billion or more. The Dodd-Frank Act creates enhanced oversight of the derivatives market and imposes safeguards and transparency on the process of securitizing pools of loans for investors. The Dodd-Frank Act also restricts banking entities from engaging in proprietary trading or investing in or sponsoring private equity or hedge funds (the “Volcker Rule”). To mitigate a grave threat posed to U.S. financial stability and subject to the concurrence of at least two-thirds of the voting members of the Council, the Federal Reserve may require designated nonbank financial companies and bank holding companies with assets of \$50 billion or more to sell or otherwise transfer assets or off-balance-sheet items to third parties, among other steps. In the event a major financial company fails, the Dodd-Frank Act provides the federal government with authority to wind it down in an orderly fashion that protects the economy and does not impose the cost on taxpayers.

II. REVIEW OF POSSIBLE LIMITATIONS REQUIRED BY SECTION 123

Section A. Explicit or Implicit Limits on the Maximum Size of Banks, Bank Holding Companies, and Other Large Financial Institutions

This section discusses limits on the size of banks, bank holding companies, and other large financial institutions. As was discussed in the report issued in 2011 under section 123 of the Dodd-Frank Act, the costs and benefits of such limits depend on the importance of scale economies, large financial institutions' ability to abuse market power, and market perceptions that large financial institutions have access to a government safety net.

The potential cost of limits on the size of financial institutions is that such limits may prevent financial institutions from achieving economies of scale and benefiting from business and geographic diversification. One potential benefit of limits on the size of financial institutions is that such limits may prevent financial institutions from acquiring market power and abusing it by setting prices anti-competitively. Another possible benefit of such limits is that they may prevent financial institutions from growing so large that they are perceived by the market to benefit from an implicit government subsidy. Limiting this perception may constrain excessive risk-taking by preventing the moral hazard associated with the perceived access to a government safety net. In addition, size limitations may allow large firms to be resolved, if necessary, in a more orderly way and with less disruption to the financial system and the economy.

Review of the Literature

An assessment of the costs and benefits of size limitations on large financial institutions depends in part on whether larger financial institutions have funding or operating cost advantages that are driven by scale economies or risk diversification. The literature review conducted for the report issued in 2011 under section 123 of the Dodd-Frank Act found evidence that larger financial institutions experience scale economies and are better able to diversify risk. Economic research in the last five years has similarly identified several fundamental reasons as to why larger banks may have a funding or an operating cost advantage, including scale economies, an ability to diversify risks across business and geographic segments, and the issuance of highly traded, liquid debt. These factors all decrease investor risk perceptions and lead to lower funding or per-unit operating costs. Other studies suggest that estimates of scale economies may be driven by funding cost advantages arising from market perceptions that the firms benefit from an implicit government subsidy or that they result from technological diversity among banks rather than a systematic relationship between asset size and returns to scale. The literature review in the report issued in 2011 under section 123 of the Dodd-Frank Act also found that there could be benefits to limiting size because, for example, merger activities that increase market concentration can result in less favorable prices for customers, although the review found mixed

evidence on the effect of market power on a firm's cost efficiency. More recent work suggests that the design of banking regulation may become more challenging going forward due to growth in bank holding company size and complexity.

Economies of Scale

The preponderance of evidence from empirical studies with better identification methods seems to be consistent with the notion that financial institutions are characterized by economies of scale. The basic definition of economies of scale is that a firm's output can be doubled for less than a doubling of cost. This often arises when a high proportion of total costs are fixed, meaning they do not vary with the level of output. The result is that the average cost of producing an additional unit of output falls as output increases. Economies of scale can also influence funding costs, for example, if investors believe that such economies render a larger institution more profitable and less likely to default. Diversification, also discussed in Section B, is often associated with larger firm size and may also lower an institution's default risk and therefore funding costs.

The concept of economies of scale is basic to the issue of placing limits on the maximum size of financial institutions. If a firm is characterized by economies of scale over the range of output it typically produces, then limiting its size will result in higher per-unit costs. Conversely, if a firm is characterized by diseconomies of scale, then limiting its size will result in lower per-unit costs.

A number of studies provide empirical support for the existence of economies of scale in banking institutions, although they differ as to whether they flatten out above some maximum size. Wheelock and Wilson (2015) find evidence of increasing returns to scale for most banks with more than \$50 billion in assets for the fourth quarter of 2006 and the fourth quarter of 2012. They also find robust evidence that the very largest banks—those with assets exceeding \$1 trillion—faced increasing returns to scale in 2006 but that the results for 2012 are decidedly mixed. The authors estimate statistically significant economies of scale in 2012 for banks with assets above \$1 trillion in a model using the most expansive definition of cost (including some fixed as well as variable costs) but detect scale economies for only approximately one-third of these banks in five other models using narrower cost definitions. They conjecture that by 2012 opportunities for scale economies may have been exhausted for banks with assets in excess of \$1 trillion but that the limited number of observations of such banks makes drawing firm conclusions impossible.

Restrepo-Tobón, Kumbhakar, and Sun (2015) estimate that about 70 percent of the top 100 U.S. commercial banks by asset size (and 98 percent of medium and small banks) exhibit substantial economies of scale. The study concludes that even the biggest commercial banks could benefit from additional economies of scale at an even larger size. While their sample includes commercial banks that are part of bank holding companies, it excludes bank holding companies themselves.

Kovner, Vickery, and Zhou (2014) present strong statistical evidence that scale economies for bank holding companies do not flatten out above any particular size threshold, as large bank holding companies can spread the fixed components of overhead such as information technology, accounting, advertising, and management over a larger asset base. As a result, the authors conclude that imposing size limits on bank holding companies would impose economic costs: they estimate that limiting the size of a single bank holding company’s assets to 4 percent of GDP, as proposed by Johnson and Kwak (2010), would raise industry noninterest expenses by \$2 to \$4 billion per quarter.

Other studies, however, have not found evidence of economies of scale. Davies and Tracey (2014) suggest that estimated scale economies for large banks are affected by the perception that these banks benefit from an implicit government subsidy, and find no evidence of economies of scale for large banks.¹ Feng and Zhang (2014), using an “output distance function” approach, find no systematic relationship between asset size and returns to scale when technological heterogeneity among banks is incorporated into their analysis. They estimate that as of the first quarter of 2010 almost 60 percent of banks with assets over \$1 billion have constant returns to scale, while 27 percent have decreasing returns, and approximately 14 percent exhibit increasing returns to scale. Inanoglu, Jacobs, Liu, and Sickles (2013) focus on the largest 50 banks by assets. Their estimation results reveal no evidence of increasing returns to scale or scope across several model specifications, and the authors find no positive correlation between bank size and technical efficiency.

Funding Costs

Studies have also addressed whether the largest financial institutions enjoy a funding cost advantage. Identification problems limit the ability of these papers to distinguish the effects of perceptions that these institutions benefit from an implicit government subsidy from size and liquidity effects. Some of the most recent studies of U.S. financial institutions find that the “unexplained” funding cost advantage of large financial institutions—that part of the advantage not attributable to a bank’s financial or operating characteristics—fell following the enactment of the Dodd-Frank Act. Academic studies estimate that the unexplained funding cost advantage of the largest banks fell by 70 to 94 percent between 2009 and 2012, to a range of 11 to 30 basis points, and estimates for 2013 fall on either side of zero. Some of the narrowing is likely due to

¹ Davies and Tracy acknowledge some weaknesses in their methods. For example, they estimate a cost function using a “pseudo” price of debt adjusted to eliminate the effect of perceptions that these institutions benefit from an implicit government subsidy, violating the assumption that banks choose their input quantities to minimize costs with respect to *actual* input prices; as a result, the interpretation of their estimated cost function is not straightforward. Moreover, due to data limitations, the prices of labor and capital are computed as the ratio of input expenditure to total assets instead of the amount of the input, which means the prices themselves may be a function of scale economies.

improved economic and financial conditions. The following are discussions of several studies using substantially post-Dodd-Frank Act data in order to highlight the effect thus far of the Dodd-Frank Act's implementation on bank funding costs. Because further regulatory requirements, particularly those applicable to the very largest banks, as described below, have been implemented since the conclusion of these studies or have not yet been implemented, as with the Federal Reserve's pending rulemaking regarding total loss-absorbing capacity, it is possible that the trends identified in these studies would continue to erode the funding cost advantages of large banks.

Balasubramnian and Cyree (2014) find that market discipline improved after the enactment of the Dodd-Frank Act. By using the 19 bank holding companies initially subject to the Comprehensive Capital Analysis and Review ("CCAR") as a proxy for firms that may be perceived to benefit from an implicit government subsidy, the authors isolate such perceptions from the more fundamental channels through which size can influence funding costs, such as operational efficiencies or improved risk diversification. They find that bond spreads for CCAR bank holding companies increased 176 basis points from the period before enactment of the Dodd-Frank Act to the period after enactment of the Dodd-Frank Act but remained about 11 basis points below rating-adjusted spreads for smaller banks. This represents a 94 percent narrowing of the funding cost advantage for CCAR banks by the end of 2011 and offers evidence that the Dodd-Frank Act has reduced perceptions of an implicit government subsidy of these institutions.

Acharya, Anginer, and Warburton (2015) estimate that institutions in the top 90th percentile in terms of assets, which includes many relatively smaller banks, had significant funding cost advantages during the financial crisis, peaking at 100 basis points in 2009, but that this gap narrowed by 70 percent by 2012.

In addition to academic research, the International Monetary Fund ("IMF") and U.S. Government Accountability Office ("GAO") both released studies on the topic in 2014. The IMF estimated that funding cost advantages for U.S. global systemically important banks ("G-SIBs") as identified by the Financial Stability Board declined sharply from their 2008 to 2009 peaks, to roughly 15 basis points in 2013, attesting to the effectiveness of regulatory reforms. The estimated funding cost advantage was lower for U.S. G-SIBs compared to institutions in the United Kingdom (20-60 basis points), Japan (25-60 basis points), and Europe (60-110 basis points).

The GAO's 2014 econometric analysis finds that large bank holding companies (those with at least \$1 trillion in assets) experienced funding cost advantages on their senior unsecured bonds over smaller bank holding companies (those with under \$10 billion in assets) during the financial crisis but that the advantage has declined significantly since then—a result consistent with the academic literature. In fact, the GAO estimates suggest that by 2012-13, larger bank holding companies may have faced a funding cost *disadvantage*. However, there is a wide range of

estimates in the GAO analysis, from a 196 basis point advantage to a 60 basis point disadvantage, depending on the specific model. The GAO notes that bond yield spreads on senior unsecured bonds are sensitive to credit risk and hence perceived government support. The report concludes that one driver of the reduction in the funding cost differential between larger and smaller bank holding companies is the reduced credit risk of the bank holding companies themselves.

A 2015 GAO report suggests that the Dodd-Frank Act has had little effect on large bank holding companies' funding costs and that any reduction in the funding cost advantage may instead be associated with improvements in some measures of bank safety and soundness. The report uses a different methodology and different assumptions than the 2014 report. For example, the 2015 analysis compares funding cost differentials for all bank holding companies with assets of \$50 billion or more against differentials for bank holding companies with assets of less than \$50 billion, rather than focusing on the very largest institutions. Funding costs are calculated as total interest expense of bank deposits or liabilities used to make loans or otherwise acquire assets, as a percentage of interest-bearing liabilities, including explicitly insured deposits; this measure is likely less sensitive to changes in perceptions that certain institutions benefit from an implicit government subsidy than to changes in bond yield spreads. Moreover, this measure would include differences in deposit services provided by different institutions (e.g., a large branch network), which are not attributable to implicit government support. The report notes that measuring the impact of the Dodd-Frank Act requirements for large bank holding companies is challenging because the effects of the statute cannot be differentiated from the effects of simultaneous changes in economic conditions and because all of the reforms under the law have not yet been fully implemented.

Size and Risk

Recent work on the possible consequences of large bank size include Cetorelli, McAndrews, and Traina (2014), who find that the growth of bank holding company size and complexity may lead to complicated and ineffective monitoring and that the design of informed regulation of complex banking organizations presents a key challenge going forward. In addition, the Federal Reserve's report "Calibrating the GSIB Surcharge" (2015) notes that failure of a G-SIB could undermine financial stability and therefore cause greater negative externalities than the failure of another type of financial institution.

Bank size can affect risk through the choice of investment strategy that a firm adopts as it grows and diversifies or through decisions about funding and capital structure. Using a theoretical model, Huang and Ratnovski (2011) find that wholesale funds used to supplement retail deposits can create risks in banks that hold mostly investment assets rather than loans because random or inaccurate information about these asset values may trigger inefficient liquidations. An IMF analysis (2013) finds that healthy banks have more diversified funding structures and that most banks have recently made their funding structures more resilient in part by reducing their

dependence on short-term wholesale funding. Hughes and Mester (2013) find that a larger institution may respond to better diversification opportunities by making riskier loans and investments as opportunities for higher returns present themselves. The higher risk management costs that are incurred as a result of this strategy may obscure underlying scale economies. After correcting for these added costs, the authors find large scale economies that increase with bank assets and conclude that they are driven by spreading overhead costs and by diversification. The authors consider that their 2007 estimate of economies of scale for the largest banks in the sample could reflect effectively subsidized funding costs due to lower risk premiums on borrowed funds, and find that their result is essentially unchanged when using funding costs of smaller banks. They also note that when using methodologies from previous work, instead of their own, the data either show no or very slight economies of scale. The study did not consider potential costs to the economy imposed by riskier investment strategies or the costs to the economy posed by the failure of a larger institution.

In a study of 700 U.S. commercial and investment banks and life insurance companies, Bhagat, Bolton, and Li (2015) find that larger asset size is associated with increased risk and higher leverage over the 2002 to 2012 time period. However, when the analysis is confined to the post-crisis 2010 to 2012 period, the authors find size does not have a statistically significant effect on risk-taking, and they conjecture that this may be due to more intense public and regulatory scrutiny of bank risk-taking during this period. This is broadly consistent with the 2015 GAO report's conclusion that while large bank holding companies have become larger, they are less vulnerable to financial distress since the enactment of the Dodd-Frank Act. Bhagat, Bolton, and Li (2015) also find that banks with better corporate governance engage in less risk-taking (although investment banks take more risk than commercial banks at any size). Thus the paper suggests that a combination of strong capital requirements and corporate governance may be necessary to limit excessive risk-taking.

Regulatory Developments

In the five years since the prior report under section 123 of the Dodd-Frank Act was issued, the bank regulatory agencies have adopted rules and guidance pursuant to their authorities under the Dodd-Frank Act that both directly constrain further growth of the largest banks by acquisitions and indirectly constrain further organic growth of the largest institutions.

Section 622 Concentration Limit

Section 622 of the Dodd-Frank Act generally prohibits a financial company from combining with another company if the resulting company's liabilities would exceed 10 percent of the aggregate liabilities of all financial companies. Financial companies subject to the limit include insured depository institutions, bank holding companies, savings and loan holding companies, foreign banking organizations, any other companies that control insured depository institutions, and nonbank financial companies designated by the Council for supervision by the Federal

Reserve. The section 622 concentration limit complements the existing 10 percent nationwide deposit cap established by the Riegle-Neal Act and expanded by section 623 of the Dodd-Frank Act,² but the section 622 concentration limit provides a more comprehensive limitation on growth by acquisition because it also takes into account non-deposit liabilities and off-balance sheet exposures. The Federal Reserve issued a final rule implementing section 622 in November 2014 that provides further detail as to how a company's liabilities and the aggregate liabilities of all financial companies are to be calculated.³ In July 2015, the Federal Reserve announced its first determination of the aggregate liabilities of all financial companies using the methodology it had adopted.⁴

The Council, as required by section 622, conducted a study in 2011 of the extent to which concentration limits would affect financial stability, moral hazard in the financial system, the efficiency and competitiveness of U.S. financial firms and markets, and the cost and availability of credit and other financial services to households and businesses in the United States. The Council study concluded that the concentration limit could reduce risks to financial stability by preventing acquisitions that could make these firms harder for their officers and directors to manage, for the financial markets to understand and discipline, and for regulators to supervise. As the Council report observed, because financial institutions with less than 10 percent of U.S. financial liabilities can be sufficiently large or otherwise critical to the functioning of financial markets to raise systemic issues in the event of failure, the concentration limit alone will not sufficiently reduce the risks posed to financial stability by large financial institutions. Other requirements that reduce risks to financial stability are discussed throughout this report.⁵

With respect to moral hazard, the Council's report on the section 622 concentration limit concluded that the limit was expected to decrease moderately the moral hazard associated with perceptions that certain institutions benefit from an implicit government subsidy but that it could

² With the amendments added by section 623 of the Dodd-Frank Act, interstate bank mergers and interstate acquisitions by bank holding companies and savings and loan holding companies may not be approved, with certain exceptions for failing institutions, if they would result in the acquiring institution controlling more than 10 percent of the total deposits of insured depository institutions in the United States.

³ 12 C.F.R. Part 251.

⁴ Federal Reserve, Announcement of Financial Sector Liabilities, 80 Fed. Reg. 38686 (July 7, 2015).

⁵ The Council study also made three recommendations: (1) measure liabilities of financial companies not subject to consolidated risk-based capital rules by using U.S. generally accepted accounting principles (GAAP) or other applicable accounting standards; (2) use a two-year average in calculating aggregate financial sector liabilities and publish annually the current aggregate financial sector liabilities; and (3) extend the "failing bank exception" to the acquisition of any type of insured depository institution in default or in danger of default, rather than only to the acquisition of banks in default or danger of default. The Federal Reserve's final rule reflects the recommendations of the Council.

slightly increase moral hazard in the sector by reducing the likelihood of takeovers of large financial companies. The Council concluded that the concentration limit was unlikely to have a significant effect on the cost and availability of credit and other financial services. As to the competitiveness of U.S. financial markets, the Council concluded that, over the long run, the concentration limit could be expected to enhance competitiveness by preventing the increased dominance of those markets by a very small number of firms.

With regard to the competitiveness of U.S. financial institutions, the Council, in its report on the section 622 concentration limit, expressed concern that the limit would introduce the potential for disparate regulatory treatment of mergers between the largest U.S. and foreign firms, depending on which firm is the acquirer or the target. This is because the statutory concentration limit includes the global liabilities of U.S. financial companies but only the liabilities of the U.S. operations of foreign firms. As a result, a large U.S. financial company could be prevented by the concentration limit from making any material acquisitions (U.S. or foreign), but a large foreign-based financial company with a relatively small U.S. presence may be able to acquire that same U.S. financial company because only the U.S. liabilities of the resulting company would be subject to the concentration limit. In 2011, for this reason, the Council recommended that the Federal Reserve continue to monitor this competitive dynamic.

As of December 31, 2014, the Federal Reserve estimated that aggregate financial sector liabilities stood at approximately \$21.6 trillion,⁶ which indicates that the 10 percent concentration limit would apply to acquisitions that would cause the acquirer to have total liabilities of approximately \$2.2 trillion or more. No U.S. bank or nonbank financial company designated by the Council for Federal Reserve supervision currently has total consolidated liabilities over that limit.

Requirement to Consider Financial Stability in Review of Acquisition Applications

The Dodd-Frank Act requires the federal banking agencies to take financial stability into consideration when considering bank merger proposals and requests to engage or acquire entities engaged in certain nonbanking activities.⁷ More specifically, the banking agencies must consider the extent to which the proposed acquisition, merger, or new nonbanking activity would pose, or would result in more concentrated, risks to the stability of the U.S. banking or financial system. In addition, in the case of bank holding companies with \$50 billion or more in total consolidated assets and nonbank financial companies designated by the Council, the Federal

⁶ 80 Fed. Reg. at 38686.

⁷ See sections 163 and 604(d), (e), and (f) of the Dodd-Frank Act; 12 U.S.C. §§ 1842(c), 1843(j)(2)(A), 1828(c)(5), and 5363. In addition, under section 173 of the Dodd-Frank Act, the Federal Reserve may take financial stability into account in reviewing applications of foreign banks to establish a branch or agency in the United States.

Reserve is required to consider whether the acquisition of control or of any voting shares of any company engaged in certain activities described in section 4(k) of the Bank Holding Company Act would result in greater or more concentrated risks to global or U.S. financial stability or the U.S. economy. This requirement complements the section 622 concentration limit and nationwide deposit limit because it requires the agencies to consider financial stability and concentration in evaluating certain acquisitions that would not trigger the 10 percent threshold of section 622.

In acting on applications subject to this requirement, the federal banking agencies have considered the following: (1) whether the proposed transaction would result in a material increase in risks to financial system stability due to an increase in size of the combining firms; (2) whether the transaction would result in a reduction in the availability of substitute providers for the services offered by the combining firms; (3) whether the transaction would materially increase the extent of the interconnectedness of the financial system; (4) whether the transaction would materially increase the extent to which the combining firms contribute to the complexity of the financial system; (5) whether the transaction would materially increase the extent of cross-border activities of the combining firms; and (6) the relative degree of difficulty of resolving the combined firm.⁸

The section 622 concentration limit, the nationwide deposit cap, and the requirement to consider financial stability in bank acquisition applications are all limited in scope, in that they apply only to acquisitions and do not limit firms' organic growth.⁹

However, other rules adopted pursuant to the Dodd-Frank Act aim to make banks internalize the costs associated with their size, specifically the risks to financial stability that the largest institutions could pose. The primary example of this is the capital surcharge that has been imposed on G-SIBs to increase their resiliency.

G-SIB Surcharge

The Federal Reserve adopted the G-SIB surcharge rule in July 2015 under section 165 of the Dodd-Frank Act. The G-SIB surcharge rule requires U.S. bank holding companies subject to the

⁸ See, e.g., Order of the Board of Governors of the Federal Reserve System Approving The PNC Financial Services Group, Inc.'s application to acquire RBC Bank (USA) (Dec. 23, 2011); OCC Corporate Decision #2012-05 re: Application to merge RBC Bank (USA), Raleigh, North Carolina, with and into PNC Bank, National Association, Wilmington, Delaware (Jan. 11, 2012); Order of the Board of Governors of the Federal Reserve System Approving Capital One Financial Corporation, McLean, Virginia, to acquire ING Bank, fsb, Wilmington, Delaware (February 14, 2012).

⁹ The Federal Reserve does, however, consider risks to financial stability in evaluating nonbanking proposals that represent organic growth, i.e., commencing a nonbanking activity without acquiring an unaffiliated business. See section 4(j)(2)(A) of the Bank Holding Company Act (12 U.S.C. § 1843(j)(2)(A)).

advanced approaches capital rules (generally, those with greater than \$250 billion in consolidated total assets or \$10 billion or more in consolidated total on-balance sheet foreign exposures) to calculate a measure of systemic importance. This measure is based on five broad categories—size, interconnectedness, cross-jurisdictional activity, substitutability, and complexity—and the calculations are carried out pursuant to a methodology prescribed by the Federal Reserve. Bank holding companies whose measure of systemic importance exceeds a defined threshold are identified as G-SIBs and are subject to an additional capital surcharge. This surcharge currently applies to eight of the largest, most complex U.S. bank holding companies, including those well below the 10 percent concentration limit under section 622 of the Dodd-Frank Act and the deposit limit under the Riegle-Neal Act. The surcharge applied to each bank holding company is based on measures of systemic importance, and the surcharges were initially estimated to range from 1.0 to 4.5 percent of each firm’s total risk-weighted assets.

In adopting the rule, the Federal Reserve estimated the harm a G-SIB would cause to the financial system if it were to fail and the probability that it would fail. The Federal Reserve then calibrated the G-SIB surcharge at a level that would reduce the expected impact of a G-SIB’s failure to near the expected impact of the failure of a large bank holding company that is not a G-SIB.¹⁰ As Janet Yellen, Chair of the Federal Reserve, has said, “[a] key purpose of the capital surcharge is to require the firms themselves to bear the costs that their failure would impose on others. In practice, this final rule will confront these firms with a choice: they must either hold substantially more capital, reducing the likelihood that they will fail, or else they must shrink their systemic footprint, reducing the harm that their failure would do to our financial system. Either outcome would enhance financial stability.”¹¹

In issuing the final rule, the Federal Reserve determined that any costs to bank holding companies and markets would be outweighed by the benefits to the increased stability of the financial system.¹² Based upon the Federal Reserve’s estimated G-SIB surcharges at the time the final rule was adopted, the aggregate risk-based capital necessary to satisfy the surcharges of the eight U.S. G-SIBs would be about \$200 billion more than what would have been required without the rule. U.S. G-SIBs report that they already hold sufficient regulatory capital to meet the final rule’s fully phased-in capital surcharge requirements. With these rules, U.S. G-SIBs can now specifically calculate what actions they would need to take to reduce their G-SIB

¹⁰ Federal Reserve, Revised Capital Rules: Implementation of Risk-Based Capital Surcharges for Global Systemically Important Bank Holding Companies, 80 Fed. Reg. 49082, 49089-92, 49108 (Aug. 14, 2015).

¹¹ Federal Reserve, Press Release (July 20, 2015), *available at* <http://www.federalreserve.gov/newsevents/press/bcreg/20150720a.htm>.

¹² 80 Fed. Reg. at 49092.

surcharge. At least one U.S. G-SIB has stated that it has taken steps to reduce its G-SIB surcharge by reducing its G-SIB score.¹³

Enhanced Supplementary Leverage Ratio

The largest U.S. bank holding companies and their insured depository institution subsidiaries are subject to the enhanced supplementary leverage ratio standards adopted by the Federal Reserve, Federal Deposit Insurance Corporation (“FDIC”), and Office of the Comptroller of the Currency (“OCC”) in April 2014, which become effective in 2018.¹⁴ Covered bank holding companies must maintain a leverage buffer greater than 2 percentage points above the minimum supplementary leverage ratio requirement of 3 percent, for a total of more than 5 percent, to avoid restrictions on capital distributions and discretionary bonus payments. Insured depository institution subsidiaries of covered bank holding companies must maintain at least a 6 percent supplementary leverage ratio to be considered “well capitalized” under the agencies’ prompt corrective action frameworks.

In finalizing the rule, the banking agencies stated that “maintenance of a strong base of capital among the largest, most interconnected U.S. banking organizations is particularly important because capital shortfalls at these institutions have the potential to result in significant adverse economic consequences and to contribute to systemic distress on both a domestic and an international scale. Higher capital standards for these institutions place additional private capital at risk before the federal deposit insurance fund and the federal government’s resolution mechanisms would be called upon, and reduce the likelihood of economic disruptions caused by problems at these institutions.”¹⁵

Leverage capital requirements are not intended to adjust for real or perceived differences in the risk profile of different types of exposures. Rather, the Federal Reserve, OCC, and FDIC adopted the enhanced supplementary leverage capital requirements recognizing that the systemic impact of distress or failure of a G-SIB is in part a product of the volume of the institution’s activities. As such, the leverage ratio requirements complement the risk-based capital requirements that are based on the composition of a bank’s exposures. Thus, the G-SIB risk-

¹³ JP Morgan Chase & Co., Earnings Presentation Slides, Exhibit 99.1 to Current Report on Form 8-K (January 14, 2016).

¹⁴ When issued, these standards applied to bank holding companies with more than \$700 billion in total consolidated assets or more than \$10 trillion in assets under custody and insured depository institution subsidiaries of covered bank holding companies. When the Federal Reserve issued the G-SIB surcharge rule, it amended the enhanced supplementary leverage ratio standards to apply to G-SIBs and insured depository institution subsidiaries of G-SIBs.

¹⁵ Federal Reserve, FDIC, and OCC, Joint Press Release: Agencies Adopt Supplementary Leverage Ratio Notice of Final Rule and Issue Supplementary Leverage Ratio Notice of Proposed Rulemaking (April 8, 2014), *available at* <http://www.federalreserve.gov/newsevents/press/bcreg/20140408a.htm>.

based capital surcharge and the enhanced supplementary leverage ratio would tend to cause G-SIBs to internalize the systemic costs of their activities in different ways, with the risk-based surcharge focusing on the type of activities and the leverage ratio focusing on their volume.

Proposed Total Loss-Absorbing Capacity and Long-Term Debt Rule

The Federal Reserve recently proposed imposing a total loss-absorbing capacity (“TLAC”) and long-term debt requirement on the U.S. G-SIBs in order to improve their resiliency and resolvability. The TLAC and long-term debt that would be required by the rule, as well as the requirements to maintain a “clean” holding company, described further in Section B below, are intended to make the U.S. G-SIBs less likely to fail and to allow them to be resolved in a more orderly way, should that be necessary, reducing the risk that the failure of a G-SIB would pose to U.S. financial stability.

Under the TLAC standard, the G-SIBs would be required to maintain outstanding TLAC in an amount not less than the greater of 18 percent of the G-SIB’s total risk-weighted assets and 9.5 percent of the G-SIB’s total leverage exposure. A buffer equal to 2.5 percent plus the G-SIB surcharge (as calculated under “method 1” of the Federal Reserve’s G-SIB surcharge rule) plus any applicable countercyclical capital buffer would be required in addition to the 18 percent risk-weighted asset component in order to avoid limits on capital distributions and discretionary bonus payments. Under the external long-term debt requirement, a G-SIB would be required to maintain outstanding eligible external long-term debt instruments in an amount not less than the greater of 6 percent plus the surcharge applicable under the G-SIB surcharge rule (expressed as a percentage) of total risk-weighted assets and 4.5 percent of total leverage exposure. Such debt would be required to be “plain vanilla,” unsecured and nonguaranteed and issued by the top-tier parent company. In the case of a resolution of the top-tier parent company, the holders of such unsecured debt would, along with shareholders, be expected to absorb losses that would effectively recapitalize the parent company’s operating subsidiaries.¹⁶

The Federal Reserve estimated that the G-SIBs currently have an aggregate shortfall of TLAC and eligible long-term debt of \$120 billion and that the total aggregate increased cost of funding to the G-SIBs to come into compliance with these requirements would be between \$680 million and \$1.5 billion annually. The Federal Reserve estimated that this increased cost of funding would lead to an increased lending rate of 1.3 to 3.1 basis points, under the conservative assumption that the G-SIBs would pass all of their increased funding costs on to borrowers. The Federal Reserve determined that this modest increase in borrowing costs of G-SIB customers

¹⁶ Federal Reserve, Total Loss-Absorbing Capacity, Long-Term Debt, and Clean Holding Company Requirements for Systemically Important U.S. Bank Holding Companies and Intermediate Holding Companies of Systemically Important Foreign Banking Organizations, 80 Fed. Reg. 74926 (Nov. 30, 2015).

would compare favorably with the reductions in risk of a failure of a G-SIB or the risk that any failure would have an effect on U.S. financial stability.¹⁷

Summary

Recent literature generally appears to continue to provide empirical support for some benefits associated with the size of large financial institutions, namely, the existence of economies of scale in banking institutions. However, funding cost advantages associated with size have appeared to decline based upon numerous studies in recent years and are estimated to decline further with the implementation of the Federal Reserve's TLAC proposal.

Since 2010, regulatory developments have affected the ability of large financial institutions to grow. In particular, section 622 of the Dodd-Frank Act established limits on the growth of large financial companies through acquisitions or mergers. While this limit does not apply to organic growth, five of the six largest U.S. G-SIBs have not grown relative to the size of the economy over the past five years.

In addition, a number of reforms under the Dodd-Frank Act have increased the costs associated with a financial company's size. Capital needs have increased substantially for U.S. G-SIBs as a result of the more stringent risk-based and leverage capital regulations discussed above, and the introduction of capital planning and stress testing requirements discussed in Section H. On a fully phased-in basis and using recent estimated surcharges, G-SIBs would be required to meet a common equity tier 1 capital ratio of between 8 and 11.5 percent to avoid limitations on capital distribution and discretionary bonuses, whereas other bank holding companies would be required to meet a 7 percent ratio. Similarly, by 2018, G-SIBs will be required to meet a supplementary leverage ratio requirement of 5 percent to avoid limitations on capital distributions and discretionary bonuses, compared to a 3 percent minimum ratio for other bank holding companies subject to the supplementary leverage ratio. Further, in CCAR the Federal Reserve applies the same scenarios to all bank holding companies in projecting post-stress capital ratios; however, the Federal Reserve may subject a bank holding company to additional components in these scenarios based on the bank holding company's financial condition, size, complexity, risk profile, scope of operations, or activities, or risks to the U.S. economy. The TLAC standard would require further issuances of capital and long-term debt by the G-SIBs in order to improve their resiliency and resolvability.

A key purpose of these requirements is to require large financial companies' equity and debt holders to bear the costs of the firms' failure. Though the additional capital and debt requirements impose additional costs on G-SIBs, benefits of these measures include a reduction

¹⁷ 80 Fed. Reg. at 74937-39.

of the risks that a G-SIB will fail and that its failure would harm U.S. financial stability and the broader economy.

Section B. Limits on the Organizational Complexity and Diversification of Large Financial Institutions

This section discusses limits on the organizational complexity and diversification of large financial institutions. While internationalization, consolidation, and conglomeration offer potential benefits to financial institutions, these developments could also lead to shifts in behavior that increase risks to financial stability.

As noted in the report issued in 2011 under section 123 of the Dodd-Frank Act, whether the benefits of diversification are larger than the costs cannot be determined from theory alone and is therefore an empirical question. Limits on the organizational complexity and diversification of large financial institutions may have important implications for the risks posed by such firms through the supply of financial services, the sources of credit available to borrowers, and the efficiency of markets in allocating capital.

Review of the Literature

A large financial institution that diversifies from its traditional business into new products and business lines takes on new risks, but the additional risk may be mitigated if the institution invests in the appropriate business expertise and risk management tools. The literature finds that how diversification affects contagion risk depends on the pattern of overlap of banks' portfolios and interbank liabilities and whether critical levels of diversification are met.

In a study of U.S. and foreign banks, De Jonghe, Diepstraten, and Schepens (2015) find that the larger the bank, the smaller the marginal increase in contagion risk due to diversification into nontraditional banking activities, as measured by the size of its noninterest income share. The authors also find that improving information disclosure through more private monitoring and stronger supervisory monitoring (in which the United States ranks at or near the highest among members of the Organisation for Economic Co-operation and Development) might be a substitute for restricting large banks' permissible range of activities, making it more likely that a bank's diversification activities will lower both its own risk and risk sharing with the financial system. Conversely, the authors find that small banks are more likely to lack the specific knowledge and tools to handle new business ventures or complex products.

Recent research finds that geographic diversification lowers bank holding company risk without lowering loan quality but may not improve the probability of survival in a crisis. Goetz, Laeven, and Levine (2014) find that geographic expansion lowers risk by reducing exposure to idiosyncratic local risks and larger institutions are better positioned to diversify risk without declines in loan quality. Specifically, a one-standard deviation increase in the geographic diversification of bank holding company assets across metropolitan areas reduces overall bank holding company risk by 34 percent, where risk is measured by the standard deviation of an institution's stock returns. Another model finds the risk reduction is four times greater for bank

holding companies that expand into metropolitan areas with different industrial structures or business cycle co-movement than for bank holding companies that expand into economically similar metropolitan areas.

Two of three indicators that the GAO (2015) used to measure the complexity of bank holding companies with assets of \$500 billion or more (the number of legal entities and number of foreign countries in which foreign legal entities are located) have remained the same or declined since 2010, and all three indicators (including the number of foreign legal entities) have fallen for bank holding companies with assets between \$50 and \$500 billion, suggesting a reduced potential for disruption of the financial system and economic activity.

How diversification affects the extent of contagion across banks, however, depends in part on the degree of overlap in bank portfolios, including the pattern of interbank liabilities (i.e., financial institutions holding liabilities or equity of other financial institutions). Arinaminpathy, Kapadia, and May (2012) find that diversification may limit individual bank default risk but may increase the potential for contagion within the banking system. Their model combines three different channels for direct spillovers from one bank to another: asset price contagion, holding excess liquid assets on the balance sheet instead of channeling resources to the interbank market, and propagation of losses when a bank defaults on its obligations to other banks. Diversification may increase the number of exposures through shared assets, thereby exacerbating the role of asset price contagion. Furthermore, they find that these effects are more pronounced in concentrated systems and continue to apply even when allowing for potential diversification benefits realized by larger banks. The authors conclude that imposing higher capital requirements on larger banks than smaller banks can enhance the resilience of the system.

In contrast, Tasca, Mavrodiev, and Schweitzer (2014) derive conditions under which greater diversification enhances stability. Using a stylized modeling framework, they find that when a firm achieves more diversification than a minimum critical level, the resilience of the banking system improves. As diversification rises above the critical level, diversification benefits more than offset the risks to financial stability due to a related increase in leverage. Within their analytical framework, diversification is measured by a bank's portfolio of risky loans and investments. From an individual bank's perspective, high leverage increases the expected return on equity but also increases default risk, while diversification reduces default risk. Contagion arises from the correlation between individual bank default probabilities; because banks cannot choose completely independent diversification strategies, their portfolios can overlap. The authors characterize as "risky" a regime in which there is either inadequate diversification or the critical diversification level is not attainable because, for example, the increase in bank default probability induced by higher leverage is greatly amplified by market volatility. Even if the theoretical critical diversification level is possible, it may not coincide with the portfolio mix that is optimal for an individual bank because of high monitoring or transaction costs. The authors conclude that an upper limit on leverage may be beneficial as not all firms will diversify up to the critical, contagion-reducing threshold.

Regulatory Developments

Resolution Plans

One ramification of greater organizational complexity at a financial institution is the increased difficulty with which any potential resolution of that financial institution could be effectuated. As such, regulators have been working to decrease the amount of organizational complexity within financial institutions to promote a more orderly resolution process. To this end, authorities are using the resolution plans mandated by the Dodd-Frank Act to better understand the workings of large financial companies and how they could be resolved if necessary.

Under the framework of the Dodd-Frank Act, resolution under the U.S. Bankruptcy Code is the statutory first option in the event of the failure of a financial company. Section 165(d) of the Dodd-Frank Act requires nonbank financial companies designated by the Council for supervision by the Federal Reserve and bank holding companies, including foreign banking organizations that are, or are treated as, bank holding companies, with total consolidated assets of \$50 billion or more to submit resolution plans (also referred to as “living wills”) periodically to the Federal Reserve, the FDIC, and the Council. The resolution plans are required to describe the companies’ plans for rapid and orderly resolution under the U.S. Bankruptcy Code in the event of material financial distress or failure.

The Federal Reserve and FDIC require that a company’s resolution plan include extensive information about, among other things, the company’s organizational structure.¹⁸ In August 2014, the Federal Reserve and FDIC identified shortcomings in the resolution plans of the largest, most complex firms, stating that those firms had failed to make or identify the kinds of changes in firm structure and practices that would enhance the prospects for orderly resolution. The agencies required those companies’ 2015 resolution plans to demonstrate significant progress in addressing the noted shortcomings and actions taken to improve resolvability under the U.S. Bankruptcy Code, including by establishing a rational and less complex legal structure that takes into account the alignment of legal entities and business lines. Financial institutions’ organizational complexity may make it “more challenging ... to untangle their relationships and determine which ones perform critical functions,” and options in a resolution “may be constrained to some degree by the existence of critical shared services.”¹⁹ Resolution plans that

¹⁸ 12 C.F.R. §§ 243.4, 381.4.

¹⁹ Arantxa Jarque and David A. Price, “Living Wills for Systemically Important Financial Institutions: Some Expected Benefits and Challenges,” Federal Reserve Bank of Richmond Economic Brief 15-08 (Aug. 2015), available at https://www.richmondfed.org/-/media/richmondfedorg/publications/research/economic_brief/2015/pdf/eb_15-08.pdf.

address these issues should help make financial companies more resolvable through bankruptcy.²⁰

Under section 165(d) of the Dodd-Frank Act, if the Federal Reserve and FDIC jointly determine that a resolution plan is not credible or would not facilitate an orderly resolution of the company under the U.S. Bankruptcy Code, then the company must resubmit a revised plan that addresses the identified deficiencies and discusses any changes in business operations and corporate structure that the company proposes to undertake to facilitate implementation of the plan. If the company does not timely submit a revised resolution plan or does not adequately remedy the identified deficiencies, the Federal Reserve and FDIC may jointly impose more stringent capital, leverage, or liquidity requirements; may impose restrictions on growth, activities, or operations; and ultimately may jointly require the company to divest certain assets or operations. Regulatory filings show that the largest companies have thousands of subsidiaries, which can increase the complexity of a resolution. Firms have been encouraged through the resolution planning process to explore ways to streamline and simplify their organizational structures. Some firms have begun to take steps to reduce their complexity, including by reducing the number of legal entities within their structure.

“Clean Holding Company” Requirement

The top-tier parent company of a large U.S. bank holding company generally acts as a holding company rather than engaging in significant operations. This relative lack of complexity at the top-tier level can facilitate the resolution of the organization, whether under the U.S. Bankruptcy Code or Title II of the Dodd-Frank Act, particularly when a single point of entry resolution strategy, discussed below in Section C, is used. To maintain and enhance this relative lack of complexity at top-tier parent companies, the Federal Reserve recently proposed prohibiting or limiting the ability of the top-tier parent company of a U.S. G-SIB and the intermediate holding companies of certain foreign banking organizations to directly enter into certain financial arrangements that could impede the company’s orderly resolution. The Federal Reserve stated in issuing the proposal that these requirements would reduce the risk of destabilizing funding runs at the holding company, reduce holding company complexity, and enhance the resiliency of operating subsidiaries during an orderly resolution.²¹

²⁰ *Id.*

²¹ Federal Reserve, Total Loss-Absorbing Capacity, Long-Term Debt, and Clean Holding Company Requirements for Systemically Important U.S. Bank Holding Companies and Intermediate Holding Companies of Systemically Important Foreign Banking Organizations, 80 Fed. Reg. 74926 (Nov. 30, 2015).

Other Considerations of Organizational Complexity

Financial institutions' organizational complexity is also taken into account in the application of various other requirements. For example, as explained in Section A, one of the factors that the Federal Reserve and OCC have taken into account in considering the effect of proposed bank acquisitions on financial stability is whether the acquisition would materially increase the extent to which the combined firms contribute to the complexity of the financial system. Likewise, organizational complexity is taken into account in the identification of a bank holding company as a G-SIB subject to the capital surcharge discussed in Section A and in the evaluation of a nonbank financial company for designation by the Council for Federal Reserve supervision.²² The FDIC has sought to address challenges presented by organizational complexity in developing strategies for implementing its resolution authority under Title II of the Dodd-Frank Act, as discussed in Section C.

Summary

Recent academic literature discusses how diversification may both provide benefits to financial institutions and present additional risks to financial stability. To the extent diversification leads to greater organizational complexity, that itself can present additional risks given the increased difficulties with resolving complex institutions.

A number of regulatory reforms implemented over the last five years have sought to mitigate the potential risks posed by organizational complexity as an impediment to an orderly resolution. Through the resolution plan process, regulators are instructing firms to provide more detailed information on, and analysis of, obstacles to resolvability and to demonstrate their progress in improving their resolvability under the U.S. Bankruptcy Code. Similarly, the Federal Reserve's recent proposals regarding the "clean holding company" requirement could help to reduce organizational complexity, especially at the top-level parent company. Regulators' continued focus on organizational complexity should help reduce the risks the failure of these firms could pose to U.S. financial stability.

²² 12 C.F.R. Part 1310, Appx. A.

Section C. Requirements for Operational Separation Between Business Units of Large Financial Institutions in Order to Expedite Resolution in Case of Failure

This section reviews operational separation between business units in large financial institutions. Operational separation aims to reduce interdependencies among a financial organization's various business units. Such interdependencies can impede a rapid and orderly resolution in the event of the company's failure. In this context, the primary challenge in a resolution arises when separate entities cannot operate independently. Separate legal entities can be integrated through intercompany agreements and shared services; operational separation contemplates business units that can operate independently from each other. With a separation of business units, each business unit may comprise numerous legal entities, but these entities are interdependent only within the business unit, not across business units.

Review of the Literature

Recent literature does not directly address how operational separation affects resolution in the event of a financial institution's failure. Operational separation imposes both costs and benefits. First, operational separation adds administrative overhead to separated business units. Overhead includes costs arising from corporate governance, management oversight, and risk management. In addition, there may be costs of organizational separation arising from diseconomies of scale. The costs of operational separation, however, must be balanced against the expected benefits of a more streamlined resolution process.

Arguments for or against separation also depend on what type of organizational structure makes an institution more likely to survive a financial crisis and therefore less likely to require a resolution. For example, based on a sample of banks in the European Union, Köhler (2015) finds that diversified commercial banks with expanded product lines, cross-selling opportunities, and a larger share of noninterest income have lower insolvency risk. These diversified banks are statistically significantly more stable and profitable, indicating that income diversification yields substantial benefits. A higher noninterest income share is also found to increase the volatility of asset returns, but this is more than offset by the positive effect of income diversification on the level of asset returns, which reduces insolvency risk on balance.

Regulatory Developments

Resolution Plans and Recovery Plans

The resolution plans discussed in Section B are required to include extensive information about a company's most material business units (referred to as "core business lines" in the resolution plan regulations) and about how they might be treated in the event of the material financial distress or failure of the company. Firms subject to resolution plan requirements are required to provide a range of specific actions that could be taken with respect to their core business lines and critical operations and a description of the funding, liquidity, and capital needs of, and

resources available to, their material entities, as mapped to their core business lines and critical operations. The plans are also required to include information about a company's processes for determining the current market values and marketability of its core business lines, critical operations, and material asset holdings and an assessment of the feasibility of plans for executing any sales, divestitures, restructurings, or recapitalizations contemplated in the resolution plan. Companies are also required to identify and map the material interconnections and interdependencies among their material entities and critical operations and core business lines.²³

Operational separateness is also implicated by the recovery plans that large financial institutions are required to develop in order to prepare for severe stress. The Federal Reserve has identified the primary goal of such recovery planning as the development of a menu of options that would enable a firm to respond to a wide range of internal and external stresses and maintain the confidence of market participants without extraordinary governmental support.²⁴ The Federal Reserve requires that these options include the possible sale, transfer, or disposal of significant assets, portfolios, legal entities, or business lines. Firms must identify impediments, such as operational interconnections and tax consequences, to such transfers and demonstrate how the planned-for options would be able to be executed expeditiously if needed. The OCC recently proposed guidance that would apply similar requirements to large national banks, federal savings associations, and federal branches.²⁵

Single and Multiple Point of Entry Resolution Strategies

In addition to presenting challenges for resolution in bankruptcy, organizational complexity and a lack of operational separability can pose difficulties for a resolution under Title II of the Dodd-Frank Act. In part to address these challenges, the FDIC has developed a single point of entry strategy for implementing its resolution authority under Title II.²⁶ Under a single point of entry strategy, the FDIC would be appointed receiver only of the top-tier U.S. holding company of a financial company subject to the orderly resolution authority, and a temporary bridge financial company would be established to hold and manage the critical operating subsidiaries as the firm is broken up and wound down. While the exact path through resolution would vary depending

²³ 12 C.F.R. §§ 243.4, 381.4.

²⁴ Federal Reserve, SR 14-8, Consolidated Recovery Planning for Certain Large Domestic Bank Holding Companies (Sept. 25, 2014) (applicable to the eight U.S. G-SIBs). *See also* Federal Reserve, SR 12-17/CA 12-14 Consolidated Supervision Framework for Large Financial Institutions (Dec. 17, 2012) (applicable to banks with over \$10 billion of assets).

²⁵ OCC, Guidelines Establishing Standards for Recovery Planning by Certain Large Insured National Banks, Insured Federal Savings Associations, and Insured Federal Branches, 80 Fed. Reg. 78681 (Dec. 17, 2015).

²⁶ *See, e.g.*, FDIC, Resolution of Systemically Important Financial Institutions: The Single Point of Entry Strategy, 78 Fed. Reg. 76614 (Dec. 18, 2013).

on the particular failure scenario, some business lines or subsidiaries (such as broker-dealers) would quickly shrink and wind down, while others would be sold off. Using this approach, the potential resolution-related challenges arising from operational complexity could be mitigated, taking advantage of the tendency for U.S. banking organizations to have bank holding companies that do not have significant operations of their own, as discussed in Section B. This approach would be further assisted by the “clean holding company” proposal discussed in Section B. The FDIC has stated that “the resolution would be confined to one legal entity, the holding company, and would not trigger the need for resolution or bankruptcy across the operating subsidiaries, multiple business lines, or various sovereign jurisdictions.”²⁷ An alternative “multiple point of entry” strategy could also be used for banking organizations that have subsidiaries with sufficiently independent operations such that they could be resolved individually.²⁸

Summary

The focuses of academic research and regulatory policy have differed in relation to operational separation. The literature addresses only limited aspects of the costs and benefits related to operational separation and centralization. Banking regulators have worked specifically to address the challenges that operational interconnectedness can pose for resolution. The banking regulators and institutions they regulate continue to refine their approach to addressing these challenges as they implement the rules and guidance discussed above.

²⁷ *Id.* at 76623.

²⁸ *Id.*

Section D. Limits on Risk Transfer Between Business Units of Large Financial Institutions

Risk transfer among business units is a key element of the risk management and operations of large financial institutions. An allocation mechanism that transfers operating capital, margin, or funding from one business unit to another may decrease the risk of the transferor and increase the risk of the transferee, or it could have the opposite effect. This section addresses the transfer of funding and capital among consolidated business units, including recent regulatory developments regarding derivatives and securities financing activities between business units.

Review of the Literature

Risk transfer across business units can help efficiently allocate risk, but it can also transmit shocks and reduce the benefits of diversification. Internal capital markets can help banks adjust to shocks by reallocating liquidity within the firm to the business unit that most needs it, but a business unit's dependence on funding from other units could adversely affect its performance if the lending units encounter financial difficulty and cease lending; similarly, a lending unit may be adversely affected if a borrowing unit becomes distressed and unable to satisfy its obligations.

The merits of limiting risk transfer within a large financial institution have not been directly addressed by academic research over the last five years. However, the literature has addressed two related topics: interfirm risk transfer and internal capital markets within banks. Papers addressing interbank risk transfer suggest that such transfers can have destabilizing effects. Acemoglu, Ozdaglar, and Tahbaz-Salehi (2015) analyze interconnectedness through interbank lending using a simulation model and find that a dense and diversified network of interbank liabilities creates channels for the propagation of large shocks. While the paper does not directly address intrabank links, it suggests that business units interconnected by a system of cross-lending may be similarly vulnerable. Similarly, in a cross-country study of the financial crisis period, Beltratti and Stulz (2012) find that short-term funding transmitted negative shocks from borrowing to lending banks, suggesting that risk transfers between a financial institution's business units may transmit negative shocks within the firm.

Other research, however, demonstrates that internal capital markets within a financial institution can mitigate the impact of financial shocks to the organization by allocating bank resources where they are most needed. Cetorelli and Goldberg (2012) document that globally active banks use internal capital markets to reallocate funds between the parent bank and affiliates in foreign countries, both in the ordinary course of business and in response to funding shocks. This paper shows that when parent banks are hit with a funding shock, they will prioritize internal flows in a manner that minimizes liquidity reallocations from affiliates important for parent bank revenue streams, while using traditional funding locations more extensively to buffer shocks to the parent. Using branch-level deposit data for U.S. banks, Ben-David, Palvia, and Spatt (2015) find that interest rates paid on deposits at branches in one state are associated with loan growth in

other states in which the bank operates, suggesting internal capital markets help reallocate a bank's funding.

Regulatory Developments

Expansion of Sections 23A and 23B of the Federal Reserve Act

Two longstanding provisions of the Federal Reserve Act, sections 23A and 23B, limit the ability of a depository institution's affiliates to transfer risk to the depository institution and the ability of the depository institution to transfer the benefit of federal deposit insurance to its uninsured affiliates.²⁹ Section 23A achieves these goals in four major ways. First, section 23A limits a depository institution's "covered transactions" with any single "affiliate" to no more than 10 percent of the depository institution's capital stock and surplus, and transactions with all affiliates combined to no more than 20 percent of the depository institution's capital stock and surplus. These covered transactions include loans or other extensions of credit to an affiliate, purchases of assets from an affiliate, investments in securities issued by an affiliate, guarantees on behalf of an affiliate, and certain other transactions that expose the depository institution to an affiliate's credit risk. Second, covered transactions between a depository institution and its affiliates must be consistent with safe and sound banking practices. Third, the purchase of low-quality assets from affiliates is generally prohibited. Last, certain credit exposures, including a depository institution's extensions of credit to affiliates and guarantees on behalf of affiliates, must be secured to the extent provided by statute. Section 23B requires that certain transactions between the depository institution and its affiliates generally must be conducted on market terms.

The Dodd-Frank Act expanded the applicability of sections 23A and 23B in several respects that further reduce transfers of risk to depository institutions. In particular, the depository institution's credit exposure resulting from derivative transactions and transactions involving the borrowing or lending of securities with its affiliate is now subject to the limitations of sections 23A and 23B. In addition, the Dodd-Frank Act amended section 23A to provide that the primary federal regulator of each depository institution is authorized to grant exemptions from section 23A so long as the FDIC does not object on the basis that the exemption presents an unacceptable risk to the Deposit Insurance Fund.³⁰

The Federal Reserve, as part of the enhanced prudential standards adopted for General Electric Capital Corporation ("GECC"), a nonbank financial company designated by the Council for supervision by the Federal Reserve, applied section 23B to GECC and its affiliates, including

²⁹ 12 U.S.C. 371c, 371c-1.

³⁰ Section 608 of the Dodd-Frank Act.

General Electric Company, effective January 1, 2018,³¹ to enhance the safety and soundness of GECC and to reduce the risk of material financial distress at GECC by ensuring that GECC is not engaging in transactions with affiliates on terms unfavorable to GECC, or in transactions that would not have been conducted but for the affiliation between the companies.³²

Margin Requirements for Non-Cleared Swaps

As required by the Dodd-Frank Act,³³ in November 2015, the Federal Reserve, OCC, FDIC, Farm Credit Administration, and Federal Housing Finance Agency published final rules establishing capital and margin requirements for dealers and major participants in non-cleared swap and non-cleared security-based swap transactions (collectively, “non-cleared swaps”) conducted by the swap entities for which they have prudential oversight (“covered swap entities”) and an interim final rule to grant an exemption from the margin requirements for non-cleared swaps meeting certain criteria that covered swap entities enter into with certain “other counterparties” and certain financial end users. In December 2015, the Commodity Futures Trading Commission (“CFTC”) issued similar rules on margin for dealers and major participants in non-cleared swaps that are subject to the CFTC’s jurisdiction.³⁴

In imposing overall margin requirements for dealers’ and major participants’ non-cleared swaps, the rules address non-cleared swaps with affiliates. The definition of “affiliate” in these rules included all consolidated subsidiaries of a dealer or major participant.

The five agencies’ rule and the CFTC rule generally require a dealer or major participant to exchange variation margin with its affiliates for non-cleared swaps between them. Under the five agencies’ rule, a dealer or major participant must collect initial margin from an affiliate. In addition, a dealer or major participant must calculate the amount of initial margin that it would be required to post to the affiliate were it subject to such a requirement and provide documentation to the affiliate of this amount.

The CFTC rule does not require a dealer or major participant to collect initial margin from an affiliate if certain conditions are satisfied. For example, to be exempt from the CFTC’s requirement to collect initial margin, the affiliate needs to be consolidated with the dealer or

³¹ Federal Reserve, Application of Enhanced Prudential Standards and Reporting Requirements to General Electric Capital Corporation, 80 Fed. Reg. 44111, 44126 (Jul. 24, 2015).

³² *Id.* at 44121.

³³ Sections 731 and 764 of the Dodd-Frank Act (7 U.S.C. § 6s; 15 U.S.C. § 78o–10), as amended by the Terrorism Risk Insurance Program Reauthorization Act of 2015 (P.L. 114–1, 129 Stat. 3).

³⁴ OCC, Federal Reserve, FDIC, Farm Credit Administration, and Fair Housing Finance Agency, Margin and Capital Requirements for Covered Swap Entities, 80 Fed. Reg. 74840 (Nov. 30, 2015); CFTC, Margin Requirements for Uncleared Swaps for Swap Dealers and Major Swap Participants, 81 Fed. Reg. 636 (Jan. 6, 2016)

major participant and be subject to a centralized risk management program that is reasonably designed to monitor and to manage the risks associated with the inter-affiliate swaps. The CFTC rules also require a nonbank dealer or major participant to post initial margin to a dealer or major participant under the prudential regulators' supervision (e.g., a bank).

Summary

While the literature on this topic is not extensive, related literature indicates that risk transfers across business units can help the consolidated organization adjust to shocks by reallocating capital or liquidity within the firm as needed but can also transmit shocks between business units.

Changes required by the Dodd-Frank Act have generally built upon the long-standing framework of protecting depository institutions that are part of a larger consolidated bank holding company. In particular, recent changes have focused on limiting how risk might be transferred between business units through derivatives transactions.

Section E. Requirements to Carry Contingent Capital or Similar Mechanisms

Contingent capital or similar mechanisms are arrangements that are intended to bolster the solvency of a financial institution following a trigger event (typically a measure of distress). Such arrangements can include debt-to-equity swaps or a permanent write-down of debt. These instruments have been discussed as a potentially lower-cost form of loss-absorbing capacity that could help address some of the challenges that were faced in the recent financial crisis.

Council Report on Contingent Capital Requirements

Pursuant to section 115(c) of the Dodd-Frank Act, the Council released a report in July 2012 on the feasibility, benefits, costs, and structure of a contingent capital requirement for nonbank financial companies designated by the Council for Federal Reserve supervision and for large, interconnected bank holding companies.

The report concluded that the issuance of contingent capital instruments could provide a useful tool for strengthening financial institutions' capital positions and ability to withstand losses during times of financial stress. The report noted that contingent capital issuances could be a way for financial institutions to increase their ability to withstand losses during financial distress at a lower cost of capital than additional common equity issuances, although contingent capital instruments are generally not as loss-absorbing as common equity. However, the report also noted various challenges associated with the structure of contingent capital instruments, including the design of the conversion feature and tax, accounting, and legal considerations. The report recommended that contingent capital instruments remain an area for continued private sector innovation and encouraged the Federal Reserve and other financial regulators to continue to study the advantages and disadvantages of including contingent capital and bail-in instruments in their regulatory capital frameworks.

Review of the Literature

Academic research on contingent convertible bonds since the report issued in 2011 under section 123 of the Dodd-Frank Act and the Council's 2012 report on contingent capital has focused on design issues. While convertible debt existed before the financial crisis, firms controlled whether and when to convert, typically subject to thresholds or constraints. However, those firms with the opportunity to convert obligations generally did not elect to do so, as noted in Bishop et al. (2009) (as well as in the report issued in 2011 under section 123 of the Dodd-Frank Act and in the Council's 2012 contingent capital study). Since the financial crisis, regulators and academics have focused work on contingent convertible bonds whose conversion is either tied to the firm's financial condition (i.e., a rules-based trigger) or triggered by a regulatory determination (i.e., a regulator-discretion trigger), rather than being at the firm's option. To date, relatively few such bonds have been issued, and the designs of offerings have varied. As a

result, there is little compelling data on these instruments, and the research literature is generally theoretical or relies on experimental simulations.

Much of the academic research has focused on trigger designs. The goal of several of the recent papers has been to develop an efficient, stability-enhancing contingent capital requirement that protects firms against losses that threaten solvency, while minimizing capital buffer costs. However, taken as a whole, researchers have not reached a consensus on such a design.

Glasserman and Nouri (2012) consider a trigger that would convert just enough debt to restore a firm to its minimum capital ratio. This process can be repeated until conversion is exhausted, at which point the firm is liquidated. The authors conclude that while convertibles may add value, the sensitivity of their model to particular assumptions suggests difficulty with widespread issuance of contingent convertibles. Theoretical work to date has largely been qualitative. This is in large part because, as Barucci and Vive (2013) note, models that attempt mathematically to derive a stable, optimal capital structure of a firm are intractable.

Maes and Schoutens (2012) discuss concerns regarding the amount of capital available after any conversion and note that even rules-based triggers can lag market conditions due to firms' capital ratio reporting delays. Both Maes and Schoutens (2012) and Krishnamurthy (2014) emphasize the superiority of designs that improve the quantity of loss-absorbing capacity available to firms over designs that simply convert debt to equity. Barucci and Del Viva (2013) find that contingent convertible bonds can reduce bankruptcy costs but increase financing costs as a result of the uncertainty imposed on bond holders.

Berg and Kaserer (2015) focus on incentives surrounding the dilution of bondholders' claims on interest or principal payments through substitution of equity. They demonstrate that whenever bondholder dilution is value-added for shareholders, it represents an opportunity to impose a transfer of value from bondholders to shareholders. Because raising capital dilutes existing shareholders' ownership claim, shareholders prefer bondholder dilution, which may disrupt the market valuation of the firm's bonds and incentivize the undercapitalization of firms near distress. Their work suggests that regulations for convertible securities that require bondholder dilution would not likely improve efficiency.

Recent empirical work focusing on the role of regulators is found in Davis, Korenok, and Prescott (2014) and Davis and Prescott (2015). Both papers rely on experimental simulations in which participants played the roles of traders in a conversion event. Results from the 2014 lab simulations concluded that the range of conversion errors was greatest under regulator-discretion based regimes. The 2015 paper reviews the 2014 results and adds experiments. This later paper finds that, for convertible designs in which bondholders are diluted, a regulator with a strong monitoring capacity does a better job converting debt holders' claims in a timely manner than is accomplished under a fixed trigger.

The literature emphasizes that regulators' ability to lower risk depends on the quality of their information and their incentives. One idea that has emerged in the literature to prevent triggering

conversion too early or too late is to have more than one trigger. Glasserman and Nouri (2012) note the challenge of choosing any particular trigger value, which motivates their look at partial conversions. The results by Barucci and Del Viva (2013) in this area are probably easiest to interpret: the more preemptive a bond's conversion threshold, the higher its yield. Higher financing costs and faster conversion increase the probability that the issuer will declare bankruptcy but lower the costs of bankruptcy.

An optimal strategy minimizes both financing and bankruptcy costs. Recent regulatory innovation has focused on a two-threshold approach, with a first threshold for "going concern" injections of loss-absorbing capacity and a second, bankruptcy threshold. Arjani et al. (2014) propose a dual trigger but point to difficulties determining an initial going-concern trigger level. Thus, they recommend designs that increase the availability of firm capital for an orderly wind-down in bankruptcy. Rochet (2014) concludes that the main point of a going-concern trigger should be to prompt regulator intervention, consistent with the analytic work in Smetters and Pericak (2013). Rochet's preferred design would involve a rules-based trigger after which the regulator would determine whether to convert debt to equity.

Regulatory Developments

The Federal Reserve, OCC, and FDIC have not required banks or bank holding companies to issue contingent capital. The agencies have instead required banks and bank holding companies significantly to increase the amount of common equity tier 1 capital, tier 1 capital, and tier 2 capital to levels that have obviated the need for a requirement to issue contingent capital instruments. As described in Section A, the Federal Reserve recently proposed requiring the U.S. G-SIBs to maintain certain levels of long-term debt that would provide additional loss absorbency in the event of a resolution of the organization.

The Federal Reserve, FDIC, and OCC, in the course of revising the eligibility requirements for regulatory capital as part of their broad overhaul of the regulatory capital rules, considered whether to permit contingent capital to qualify as tier 1 capital and determined that restricting tier 1 capital instruments to those classified as equity under GAAP, which would essentially exclude contingent capital instruments, would better ensure the ability of banks and bank holding companies to absorb losses.³⁵ Although contingent capital instruments, if properly structured, could qualify as tier 2 capital, banks and bank holding companies in the United States have not shown an appetite for issuing contingent capital that does not qualify as tier 1 capital, given the obstacles to doing so discussed in the Council's 2012 report on contingent capital.

³⁵ OCC and Federal Reserve, Regulatory Capital Rules, 78 Fed. Reg. 62018, 62048 (Oct. 11, 2013); FDIC, Regulatory Capital Rules, 78 Fed. Reg. 55340, 55367 (Sept. 10, 2013).

European authorities allow contingent capital in the form of contingent convertible bonds to count toward satisfying requirements implemented under international standards such as the Basel capital standards and the Financial Stability Board’s final TLAC standard. In the fall of 2015, the Swiss Financial Market Supervisory Authority announced an increased two-tier contingent capital requirement that defines minimum capital levels in terms of leverage ratios and risk-weighted assets.³⁶

Summary

The academic literature largely focuses on issues of design, particularly how to structure contingent capital instrument trigger mechanisms. The Council’s 2012 report on contingent capital stopped short of recommending that such instruments be required for use in the United States, saying instead that it is an area for continued private sector innovation. At this time, the U.S. banking regulators have not implemented a contingent capital requirement, instead focusing on requiring greater amounts of capital and long-term debt, as described in Section A.

³⁶ Swiss Financial Market Supervisory Authority (FINMA), “New ‘too big to fail’ capital requirements for global systemically important banks in Switzerland” (Oct. 21, 2015).

Section F. Limits on Commingling of Commercial and Financial Activities by Large Financial Institutions

This section discusses the commingling of commercial and financial activities by large financial institutions in the United States. The mixing of banking and commerce may involve commercial firms entering the market for banking products or services or, conversely, banking firms entering the market for commercial products or services.

The recent literature on this topic is relatively limited and relates mostly to Glass-Steagall policies that separated most commercial banking functions from securities transactions.

Review of the Literature

Since 2011, the costs and benefits of comingling commercial and financial activities of large financial institutions have not been active areas of economic research. However, two recent papers examine this question.

Funk and Hirschman (2014) explore concerns about the ability of regulation to keep up with financial innovation. Their paper argues that product innovation led to the demise of the separation of commercial and investment banking under Glass-Steagall even before the passage of the Gramm-Leach-Bliley Act. Although the authors cite swaps as playing a particularly important role, they note that regulation motivates actors to create new financial products that are outside of defined regulatory categories. They conclude that effective financial regulation requires flexibility and a monitoring regime that adjusts to change in the industry. This paper emphasizes the dynamic relationship between product innovation and regulation and suggests that a return to a formal separation between commercial banking and financial activities would entail long-term costs with only temporary benefits. In a recent report, Carpenter, Murphy, and Murphy (2016) reach a similar conclusion. They document an erosion of the clear-cut separation of commercial and investment banking and securitization while Glass-Steagall was still in effect, as a result of market, statutory, and regulatory changes, coupled with evolving judicial opinions. They do not recommend a return to legal separation, concluding that the financial history from 1970 onward, in particular, suggests that regulatory walls like Glass-Steagall can erode over time.

Regulatory Developments

In January 2014, the Federal Reserve issued an advance notice of proposed rulemaking to facilitate its review as to whether it would be appropriate to impose additional limitations or conditions on the conduct of physical commodity activities by certain bank holding companies and their subsidiaries to ensure these activities are conducted in a manner that is consistent with

safety and soundness and financial stability.³⁷ At that time, the Federal Reserve noted that in the past several years, some bank holding companies had expanded their activities involving physical commodity trading or acquired securities firms that engaged in substantial physical commodity activities. The Federal Reserve also cited recent environmental catastrophes involving physical commodity activities as indicating that the risks of conducting physical commodities activities can be significant.

Summary

Recent literature provides relatively limited insight into the effects of the separation of banking and commerce. The Federal Reserve's consideration of a potential rulemaking relating to bank holding companies' commodities activities is an example of how regulators continue to monitor potential risks arising from commercial activities conducted by banking organizations.

³⁷ Federal Reserve, *Complementary Activities, Merchant Banking Activities, and Other Activities of Financial Holding Companies Related to Physical Commodities*, 79 Fed. Reg. 3329 (Jan. 21, 2014).

Section G. Segregation Requirements between Traditional Financial Activities and Trading or Other High-Risk Operations in Large Financial Institutions

In 2013, the final rules implementing section 619 of the Dodd-Frank Act, known as the Volcker Rule, were adopted.³⁸ The Volcker Rule generally prohibits banking entities (i.e., insured depository institutions and their affiliates, as well as any foreign banking entity that operates a branch, agency, or commercial lending company in the United States) from engaging in proprietary trading or from acquiring or retaining an ownership interest in, sponsoring, or having certain other relationships with hedge funds or private equity funds, subject to certain exceptions and exemptions.

Banking entities have generally been required to comply with the Volcker Rule's requirements since July 2015 (except for a limited extension related to investments in certain legacy covered funds in place as of December 31, 2013). Since 2011, the academic literature has addressed several aspects of the Volcker Rule, including the rule's potential effectiveness relative to alternative approaches. However, partially due to its recent implementation, limited data is currently available to allow for the measurement of the costs and benefits of the Volcker Rule. Market participants and regulators will require additional time and data to fully assess the rule's impact.

Review of the Literature

Recent research related to the effects of the Volcker Rule has addressed the rule's implications for securities market liquidity and the quality of market making, as well as its impact on risks to the financial system relative to higher capital requirements. Other literature has addressed the rule's impact on the risk posed by individual financial institutions.

A series of papers debate the effectiveness of the Volcker Rule relative to higher capital requirements in reducing risks to financial stability and the effects on liquidity and market making. Chow and Surti (2011) and Barth and McCarthy (2013) argue that regulatory capital and liquidity requirements for market making would be a more cost-effective method of treating associated risks than the Volcker Rule. In addition, Barth and McCarthy and Whitehead (2011) contend that the Volcker Rule could have the unintended consequence of shifting risk-taking to less-regulated parts of the financial system that may be less resilient. However, Richardson (2011) asserts that relying on higher capital requirements is not a panacea and that it should be

³⁸ 12 U.S.C. § 1851; OCC, Federal Reserve, FDIC, and Securities and Exchange Commission, Prohibitions and Restrictions on Proprietary Trading and Certain Interests in, and Relationships With, Hedge Funds and Private Equity Funds, 79 Fed. Reg. 5536 (Jan. 31, 2014); CFTC, Prohibitions and Restrictions on Proprietary Trading and Certain Interests in, and Relationships With, Hedge Funds and Private Equity Funds, 79 Fed. Reg. 5808 (Jan. 31, 2014).

supplemented with Volcker Rule-type restrictions because certain types of assets are ill-suited to capital-based regulation. Because of the low probability of high losses on certain assets, relying on capital regulation alone could cause banks to hold inefficiently high amounts of capital. Choi and Shachar (2013) find that during the financial crisis, dealers, including proprietary trading desks at investment banks, provided liquidity to the corporate bond market, while excessive arbitrage trading by hedge funds disrupted credit markets. The authors suggest that it would be undesirable for other institutions such as hedge funds to fill any gap in market making created by the Volcker Rule.

Empirical papers covering the post-Dodd-Frank Act period are supportive of the Volcker Rule. Trebbi and Xiao (2015) examine whether the Volcker Rule has inhibited banks' corporate bond market-making ability with unfavorable consequences for market liquidity. They find no statistically significant evidence of substantial deterioration in market liquidity during the time period from around approval of the Dodd-Frank Act in 2010 through December 2014, during which time the major banks announced shutdowns of their proprietary trading desks.

Hu, Jain, and Jain (2013) examine the relationship between the relative effective spread, a measure of stock market liquidity similar to the bid-ask spread, and equity trader funding costs, as measured by the TED spread (the difference between the interbank lending rate and short-term U.S. government debt). While higher funding costs are generally associated with larger stock price spreads, the authors find a statistically significant decrease in the effect of the TED spread on stock price spreads following enactment of the Volcker Rule in July 2010, suggesting that the rule moderated the effect of funding costs on stock market liquidity. The study controls for the effects of the Supervisory Capital Assessment Program bank stress tests, market capitalization, stock trading volume, and volatility, but does not control for the effect of other provisions in the Dodd-Frank Act. The study did not examine the effects of funding costs on the liquidity of the fixed income markets.

Empirical research after the Dodd-Frank Act also finds that the Volcker Rule has reduced risk. Madura and Premti (2014) find that valuations of money center banks declined in response to specific events signaling the development of the Volcker Rule between 2010 and 2012 but that valuations of non-money center banks were not affected significantly, which indicates that the valuations of those banks most actively engaged in proprietary trading were most negatively affected. Further, the authors present strong statistical evidence that the market *beta* declined for all publicly traded banks (and proportionately more for money center banks) following the President's initial endorsement of the Volcker Rule in 2010, which they attribute to increased investor confidence that the Volcker Rule would allow for a more stable banking industry (*beta* is a measure of the sensitivity of a given investment or portfolio to movements in the overall market). The study controls for the impact of broad announcements about the Dodd-Frank Act in general in order to distinguish the effects of the Volcker Rule from other signals about the Dodd-Frank Act. Calomiris and Nissim (2014) find that, since the crisis, investors view noninterest sources of income as less persistent or more risky, possibly in reaction to banks'

plans to comply with new regulatory initiatives such as the Volcker Rule, and that the positive effect of noninterest income on market-to-book ratios has declined. This finding is consistent with the market valuation effects described by Madura and Premti.

Keppo and Korte (2015) identify an overall decline in bank holding company default risk in the 10 quarters following the enactment of the Dodd-Frank Act (compared to the 10 quarters before), in their view mainly driven by the financial crisis and not just regulatory reforms. They detect no statistically significant differential effects for those bank holding companies that had large trading books in the pre-Dodd-Frank Act period and that would presumably be most affected by Volcker Rule trading restrictions. The authors note that the Volcker Rule was not yet fully implemented at the time of their paper and that they might find different results when repeating the study after 2016.

Regulatory Developments

As noted above, the rules implementing the Volcker Rule generally prohibit banking entities from engaging in proprietary trading as well as investing in, sponsoring, or having certain relationships with hedge funds or private equity funds (referred to as “covered funds”). Consistent with the statute, the rules provide exemptions for certain activities related to market intermediation and covered fund investment activities.

Proprietary trading is defined in the Volcker Rule as engaging as principal for the trading account of the banking entity in any purchase or sale of one or more financial instruments. Permitted activities exempted from the general prohibition on proprietary trading include market making–related activities, risk-mitigating hedging activities, underwriting, trading in U.S. government obligations, trading by foreign banks in sovereign obligations of their home country, certain trading on behalf of customers, trading that occurs solely outside the United States by foreign banking entities, and trading by insurance companies. Permitted activities are subject to certain requirements under the final rule, including compliance program requirements. The statute also prohibits an activity or investment that would involve or result in a material conflict of interest between the banking entity and its clients, customers, or counterparties, or result in a material exposure to high-risk trading assets or strategies.

In addition, the Volcker Rule requires banking entities to create a comprehensive internal compliance program to ensure they are in full compliance with the final rule. The final rule created a tiered compliance regime, with progressively more stringent requirements based on a firm’s size and involvement in covered activities. Certain of the largest firms subject to the Volcker Rule must also report quantitative measurements that are designed to monitor their covered trading activities. In addition, as part of the compliance program, the final rule requires the chief executive officer of certain of the largest banking entities to attest annually that the firm has processes in place to establish, maintain, enforce, review, test, and modify its compliance program in a manner reasonably designed to achieve compliance with the rule.

To minimize the burden on smaller banking entities, a banking entity with total consolidated assets of \$10 billion or less that engages in covered trading activities or covered fund activities may satisfy the compliance program requirements of the final rule simply by including in its existing compliance policies and procedures appropriate references to the requirements of the statute and the final rule and adjustments as appropriate given the activities, size, scope, and complexity of the banking entity. Firms that do not engage in subject activities (other than trading in U.S. government, agency, and municipal securities) are not required to develop any compliance program.

As of July 21, 2015, banking entities were expected to be in compliance with the Volcker Rule for all proprietary trading activities and all non-legacy covered fund investments and relationships (i.e., those entered into after December 31, 2013).³⁹

Several of the largest financial institutions began making changes to trading and investment activities shortly after the Dodd-Frank Act was adopted. For example, Goldman Sachs began liquidating equity proprietary trading positions in 2010, followed by the liquidation of proprietary positions held within its fixed income, currency, and commodities operating segment in early 2011.⁴⁰

A number of financial institutions also announced that they had divested or amended their sponsorship and investments in legacy covered funds in a manner consistent with the Volcker Rule. For example, in 2011, Morgan Stanley sold its majority stake in the hedge fund FrontPoint.⁴¹ In 2014, JPMorgan Chase sold approximately 50 percent of the portfolio companies held by its principal private equity unit, One Equity Partners, to two outside private equity firms.⁴²

In addition to increased compliance costs, there has been extensive commentary by market participants and other stakeholders regarding whether the Volcker Rule has reduced market liquidity or increased trading costs due to decreased market-making activities by banking entities. The Volcker Rule recognizes the importance of market liquidity by expressly permitting

³⁹ In December 2014, the Federal Reserve granted a limited extension until July 21, 2016, for banking entities to conform investments in and relationships with legacy covered funds (including foreign funds) in place as of December 31, 2013, and announced its intention to act again to grant banking entities an additional one-year extension of the conformance period until July 21, 2017, to conform ownership interests in and relationships with legacy covered funds.

⁴⁰ The Goldman Sachs Group, Inc. Annual Report on Form 10-K for the year ended December 31, 2010, p. 59.

⁴¹ Morgan Stanley Annual Report on Form 10-K for the year ended December 31, 2011, p. 70.

⁴² JPMorgan Chase & Co., Press Release, Group Led by Lexington Partners to Acquire Portion of JPMorgan Chase's Interests in One Equity Partners (Aug. 11, 2014), *available at* <http://investor.shareholder.com/jpmorganchase/releasedetail.cfm?ReleaseID=865583>.

banking entities to engage in economically important activities such as market-making, underwriting, risk-mitigating hedging, and trading in certain U.S. and foreign government obligations. However, because the conformance period for most of the Volcker Rule's requirements (except for legacy covered funds) ended only in July 2015, limited data is currently available to allow a full assessment of the rule's effects on market-making behavior and potential impacts on market liquidity. Further, market liquidity is affected by many factors that emerged before the Volcker Rule came into effect. Some of those factors are inherently cyclical in nature, such as the effects of interest rates on trading activity and the decline in high-yield bond values associated with lower commodity prices. Other factors are longer-term trends that predate the financial crisis and reflect the evolution of market structure, such as markets becoming more electronic, non-traditional market-makers playing a greater role, and the growth of more passive investment strategies in the asset management industry. The Treasury Department continues to monitor new information in this area. Additional data and research will be necessary in order better to understand the key drivers of these market dynamics and to develop assessments of liquidity conditions over time.

Summary

Because most of the Volcker Rule's requirements came into effect only in July 2015, data and research on the rule's effects, including its effects on market liquidity, are limited. Banking entities, in divesting investments and businesses to come into compliance with the Volcker Rule, have exited the trading and funds activities identified by Congress as posing undue risk to the financial system. The rule's effects, including costs and benefits of reduced risk-taking by banking entities and its impact on permitted activities such as market-making, underwriting, and trading in government obligations, should be a fertile area for further research.

Section H. Other Limitations on the Activities or Structure of Large Financial Institutions That May be Useful to Limit Systemic Risk

This section discusses stress test requirements, capital planning requirements, regulatory capital requirements, and liquidity requirements, which have been the subject of significant attention by academics and regulators over the past five years as additional means to mitigate threats to financial stability.

Review of the Literature

Stress Tests and Capital Planning

Stress tests were not considered in the report issued in 2011 pursuant to section 123 of the Dodd-Frank Act. However, since that time they have become standard tools for analyzing the potential transmission of threats to financial stability. Periodic stress tests have become an important way for the Federal Reserve to assess whether large financial institutions maintain sufficient capital to support their operations even under severe economic and financial stress. The execution of stress tests and capital planning on an institution-by-institution basis helps ensure that the risks posed by the specific activities and structures of large financial institutions are reflected in their capital requirements.

Macroprudential stress tests have substantially evolved in the past five years. Before the financial crisis, regulators focused stress test exercises on firm-level solvency, or microprudential risks. Surveying and summarizing the development of data-driven approaches to heading off risks ahead of the report issued in 2011 under section 123 of the Dodd-Frank Act, Gramlich et al. (2010) offer design principles for selecting risk measures, factors, and models. The IMF (2009) estimated the potential cost of systemic downturns and emphasized that the early warning provided by stress tests can lead to less frequent and less severe downturns. Their proposed design principles are notable for incorporating both microprudential and macroprudential perspectives, along with structural considerations of the financial system. Consistent with this work, literature since the report issued in 2011 under section 123 of the Dodd-Frank Act generally discusses design features that would improve the macroprudential aspects of stress testing in the United States and internationally.

Development of the current U.S. stress testing system began with the Supervisory Capital Assessment Program (“SCAP”) of 2009. As described in Bookstaber et al. (2013), the Federal Reserve required all CCAR banks to conduct a uniform stress test to specified macroeconomic conditions. Regulators and financial firms have since invested in significant efforts to develop synthetic testing environments (models) that are better for estimating the health of a firm in both the microprudential and macroprudential climate of a potential financial crisis.

Following the SCAP, most countries, including the United States, have taken an incremental, evolutionary approach meant to protect against weaknesses in any one model. Innovation in the

modeling process is meant both to encourage firms' maintenance of active independent risk management systems and to protect against a "model monoculture," as described in Bernanke (2013). Bernanke notes that the differences in stress test results produced by supervisors and banks offer diversification value, both in terms of assessed risks and expected damages from risk manifestation. The protective value of the evolutionary approach is emphasized in other recent work such as Glasserman and Tangirala (2015). OCC (2013) notes that regulators' independent interpretation of risks is meant to protect against blind spots in institutions' internal risk evaluations, for example, by using stress tests to determine whether additional analytical techniques and exercises are appropriate for a covered institution, and annually revising stress tests as appropriate to enable the scenarios to capture evolving risks and vulnerabilities.

The Basel Committee on Banking Supervision (2015) contends that, to the extent liquidity issues were considered in pre-crisis stress tests, they were considered separately from solvency issues. In periods of stress, however, declines in firm and market liquidity may coincide with write-downs of asset values. Thus, solvency and liquidity risks can interact.

The Basel Committee on Banking Supervision (2013) emphasizes that macro stress is strongly related to liquidity. Citing Cifuentes, Ferrucci, and Shin (2005) and Fisher (1933), the Basel Committee on Banking Supervision (2013) points out that liquidity buffers are important for counterbalancing "fire sales" of assets during crises. Liquidity buffers, however, are expensive, because they commit capital that might otherwise facilitate economic development to lower-yielding assets. As a result, much of the recent emphasis in the literature as well as in practice has been on developing more macroprudential stress tests that balance the cost of liquidity buffers against estimated contagion risks.

Liang (2013) emphasizes the important shift in the focus of stress testing from the likelihood of a shock to the estimation of its severity. The Basel Committee on Banking Supervision (2015) highlights the development of research on interbank networks for illuminating both common exposures across the network, as in Cifuentes, Ferrucci, and Shin (2005), and network shock propagation, as modeled in Drehmann and Tarashev (2013), in which liquidity is modeled as it relates to bank susceptibility and then to transmission. The research on the interdependency of reactions of banks to a solvency challenge of any particular bank within the network has found its way into stress tests. For example, regarding transmission, the Federal Reserve's 2015 stress test included consideration of a bank holding company's financial soundness following estimated losses stemming from the default of the bank holding company's largest counterparty.

Because the integration of macroprudential liquidity modeling is relatively new, there is some variation in the way central banks have framed and modeled the problem. Many current efforts are influenced to some degree by the work of Bolton, Santos, and Sheinkman (2011) who integrate a classic maturity mismatch problem as motivating a call for liquidity in a model with many salient market features, such as asymmetric information and meaningful opportunity costs arising from liquidity. These features interact against one another, helping to set a prescription

for the amount of liquidity participants should hold, contingent on the degree of imperfection (asymmetry) of information about asset quality within the network.

Simulation and testing environments depend broadly and critically on assumptions for their assessment and prescriptions. These are generally set by regulators, with feedback over the iteration of testing exercises and results. Assumptions can be too lenient or strict, or too narrowly construed, with implications both for the relevance of results and for the costs of compliance. For this reason, central banks and other key regulators have taken to comparing their approaches in forums such as the Basel Committee on Banking Supervision. The Basel Committee on Banking Supervision (2015) details the approaches of central banks in Austria, Canada, Korea, Mexico, the Netherlands, and Norway, and characterizes broader aspects of the approaches of a larger set of central banks. This work suggests relative strengths and weaknesses and addresses the relative benefits of increasing the complexity of stress tests in terms of counterparty dynamics, asset type, information transmission, and other modeling dimensions.

Moreover, the financial community has incorporated some of these techniques into internal modeling. A recent paper by The Joint Forum (2015) reported on a survey of financial firms and supervisors. The firms reported improved management of credit risk in governance and risk-reporting channels. They also noted that stress testing has been a driver of internal modeling enhancements.

Capital and Liquidity

This section reviews literature on capital and liquidity that directly addresses financial institution soundness and systemic stability. The substantial economic literature that concentrates on other aspects of capital and liquidity, such as impacts on monetary policy and potential procyclical effects of capital requirements, lies beyond the scope of this review.

Effects of Capital on Banking Stability

Research finds that higher levels of capital or capital requirements targeted to reflect bank risk contributions to the financial system, as measured both by the risk characteristics of assets and by simple measures of balance sheet size and financial leverage, reduce bank default risk and enhance financial stability.

Effects of Capital on Financial Institution Default Risk

Berger and Bouwman's (2013) study of U.S. banks finds that bank equity capital enhances medium and large banks' survival rates during banking crises.⁴³ During normal conditions, capital buffers are less critical to medium and large banks, as they can access financial markets and interbank relationships to mitigate risk. Capital plays a more pivotal role during banking crises, when financial and interbank markets may not provide sufficient protection against negative shocks.

Furthermore, capital requirements tailored to individual institutions' risk profiles may improve systemic stability. Research by Gauthier, Lehar, and Souissi (2012) on six large Canadian banks shows that macroprudential capital standards, where each bank's contribution to the overall risk of the financial system determines its regulatory capital requirement, can significantly increase institution and systemic stability even when aggregate capital levels are held constant. The authors present five alternative macroprudential capital allocation mechanisms; all five lower average bank default probabilities and reduce the probability of a financial crisis by 25 percent on average, relative to observed capital allocations.

Research suggests that simple leverage ratios provide additional information about bank solvency or distance to default and appear closely associated with bank stability and performance. Kiema and Jokivuolle (2014) use a theoretical model to show that complementing a risk-based capital requirement with a non-risk weighted leverage ratio may enhance bank stability under plausible conditions. In the presence of model risk (which allows an unanticipated shock to loan default rates), they find a 3 percent leverage ratio overlaid onto a risk-weighted capital requirement reduces expected bank failures when actual loan default probabilities exceed the default probabilities expected by banks and regulators.⁴⁴ An alternative higher leverage ratio case (11.2 percent) results in substantially fewer expected bank failures, but the net welfare effect is uncertain. Demirguc-Kunt, Detragiache, and Merrouche (2013) analyze the effects of alternative types of capital on bank stock price movements, using an international sample of developed country banks. They find that bank equity prices were more sensitive to simple leverage measures than to risk-weighted capital measures during the 2007 to 2009 financial crisis, particularly among banks with over \$50 billion in total assets. Higher leverage ratios were associated with considerably smaller equity price declines for large banks during the crisis, while risk-based capital had less influence. The authors interpret the results as suggestive of market participants viewing the capital risk weighting as insufficient reflections of the true

⁴³ The main model measures capital as the ratio of equity capital to gross total assets. The authors also run sensitivity analyses using the tier 1 risk-based capital ratio and the total risk-based capital ratio. Sensitivity results are similar to the main results.

⁴⁴ In the model, this result holds for loan default probabilities up to 17 percent.

bank portfolio risk during the crisis. Berger and Bouwman (2013) find that simple leverage ratios predict bank performance during a crisis but that risk-weighted measures of assets have lesser predictive power. However, their analysis shows that using tier 1 risk-based capital ratios yields broadly similar results as the analysis using simple leverage ratios. That is, bank survival appears directly related to both types of capital.

Recent studies suggest higher capital levels can help dampen the negative effects of financial shocks. Martinez-Miera and Suarez (2014) model potential tradeoffs associated with higher capital standards. Their highly stylized model estimates that a capital requirement of 14 percent reduces default and contagion risks and maximizes economy-wide consumption (the benefits outweigh the costs) but also could decrease lending compared to a 7 percent capital requirement. However, the higher capital case provides substantially greater resilience to a systemic shock in terms of mitigating the drops in consumption, GDP and lending following a shock. The model is illustrative of potential financial sector dynamics; it does not represent the U.S. economy.

Clerc et al. (2015), using a different model of the effects of higher capital requirements⁴⁵ on the economy, also find that they would improve resilience to shocks. In normal economic environments, a higher capital requirement maximizes economy-wide consumption and increases GDP while reducing average bank default rates and total credit, compared to the baseline capital requirement. In crisis environments, higher capital requirements mitigate reductions in both GDP and credit, and virtually eliminate associated bank defaults, relative to baseline (lower) capital requirements.

Giordana and Schumacher (2012) find that lagged values of capital-to-assets ratios are highly significant determinants of a bank “distance to default” metric among institutions in Luxembourg. This result supports the consensus view that bank capital strengthens solvency.

Potential Responses to Capital Standards

One study is suggestive of how some financial institutions might respond to higher capital levels in ways that might increase their risk exposures. This analysis does not directly address capital standards, but it may offer insight on a potential response to higher capital. Duchin and Sosyura (2011) find that banks receiving capital infusions through the Capital Purchase Program (“CPP,” part of the Troubled Asset Relief Program) during the 2008 to 2009 program period took on greater risk in their retail and corporate lending and investment practices than did similar banks not receiving CPP funds. This finding is consistent with other research suggesting that banks that hold higher levels of capital are better able to maintain their lending during crisis periods. The greater risk-taking among CPP recipients is associated with an increase in the probability of

⁴⁵ The baseline capital requirement is 8 percent for corporate loans and 4 percent for mortgage loans. The “high capital” requirement is 10.5 percent and 5.25 percent, respectively.

bank distress and higher risk to the overall system. The capital injections raised recipients' average capital-to-assets ratio from 9.9 to 10.9 percent, signaling reduced leverage, while at the same time, market indicators (market *beta* and stock return volatility) show risk levels increased.

Effects of Liquidity on Banking Stability

In general, liquidity for large bank holding companies with assets of \$50 billion or more and nonbank financial companies designated by the Council for Federal Reserve supervision seems to have improved since 2010, as indicated by the GAO (2015). The GAO defines liquidity as the ability to fund assets and meet obligations, and states that improvement has occurred partly because of less need for liquidity (including declines in trading liabilities) and greater availability of liquidity (including increases in securities); off-balance sheet items are not included. Nevertheless, when taken together with other bank performance indicators reviewed by the GAO, these measures suggest that large bank holding companies with assets of \$50 billion or more have become less vulnerable to financial distress since the Dodd-Frank Act.

Bank liquidity levels are subject to a variety of regulatory requirements, including the stress tests discussed above and requirements to maintain adequate liquidity risk management processes. The studies reviewed below provide mixed evidence on the effects of two specific types of liquidity requirements on banking stability. In particular, the Basel III net stable funding ratio (“NSFR”) appears supportive of reduced bank default risk, but the liquidity coverage ratio (“LCR”) shows only weak associations with default risk. The research is preliminary because the proposed standards have evolved and are still being phased in.

Effects of Liquidity on Financial Institution Default Risk

Hong, Huang, and Wu (2014) find that idiosyncratic liquidity risk, represented by the Basel III liquidity standards, is weakly associated with bank failure rates in 2009 and 2010. In contrast, market-based liquidity risk, proxied by the spread between the three-month LIBOR and the three-month U.S. Treasury bills rate, shows a robust association with predicted bank failures. Specifically, both direct and indirect (using liquidity risk variables interacted with the capital-to-assets ratio) models find that market-based liquidity risk strongly and consistently increases the probability of bank failures. The authors find that the Basel III NSFR, a medium-term liquidity requirement, is associated with lower bank failure probabilities, but its magnitude is small and the results are ambiguous as to whether the LCR is associated with an increase or a decrease in bank failures. The authors note that the LCR is designed to help solvent banks endure a liquidity shock, not to restore solvency during a crisis, so the LCR results are unsurprising.

Giordana and Schumacher (2012) find that Basel III liquidity standards would reduce the probability of bank defaults in Luxembourg and thereby help to improve the financial soundness of the banking sector. They find that the two components of the NSFR (the “available stable funding ratio” and the “required stable funding ratio”) help explain the probability of bank default, suggesting that the NSFR leads to greater funding stability by reducing bank default risk.

However, they find no evidence that the high-quality liquid assets component of the LCR reduces the probability of bank default, suggesting that short-term liquidity has no direct effect.⁴⁶ The study concludes that the Basel III liquidity standards may be more effective in improving bank resiliency during financial crises (e.g., the 2007 to 2009 financial crisis) than in a sovereign debt crisis (e.g., the 2011 European debt crisis).

Macroprudential Use of Liquidity Standards

The LCR standard is designed as a microprudential instrument that helps assure banks' short-term liquidity needs are met. Van den End and Kruidhof (2012) explore a different issue by modelling the potential for using the LCR as a tool for macroprudential management by allowing regulators to modify the construction of LCR requirements during periods of stress in order to mitigate adverse potential spillovers. Their results suggest that partially relaxing the LCR may help to stabilize liquidity markets at low and moderate stress levels, but not at high stress levels, making it a potentially useful tool for macroprudential management in certain circumstances.

Regulatory Developments

Company-Run Stress Tests

As mandated by the Dodd-Frank Act, bank holding companies with more than \$50 billion in total consolidated assets, nonbank financial companies designated by the Council for Federal Reserve supervision, and certain other financial companies with more than \$10 billion in total consolidated assets are required to conduct annual stress tests. In conducting the stress tests, these institutions must use stress scenarios provided by federal regulators. A firm reports the results of its stress test to the relevant regulatory agency.⁴⁷

Supervisory-Run Stress Tests and CCAR

Bank holding companies with total consolidated assets of \$50 billion or more, nonbank financial companies designated by the Council for Federal Reserve supervision, and, beginning in 2018, intermediate holding companies required to be established by foreign banking organizations, are subject to the following additional standards:

- The Federal Reserve conducts a stress test of these institutions to determine whether they have the capital necessary to absorb losses and continue their operation by maintaining

⁴⁶ It is possible that the one-quarter lag structure used to model the influence of explanatory variables on bank default probabilities may not accurately capture the effect of the short-term liquidity requirement (which is defined on a one-month time scale).

⁴⁷ See, e.g., 12 C.F.R. Part 252, Subparts B and F (Federal Reserve); 12 C.F.R. Part 325, Subpart C (FDIC); 12 C.F.R. Part 46 (OCC).

ready access to funding, meeting their obligations to creditors and other counterparties, and continuing to serve as credit intermediaries under at least three scenarios—a baseline scenario, adverse scenario, and severely adverse scenario—with additional scenarios imposed on the very largest institutions, as described below.⁴⁸

- Complementary to the stress testing requirements under the Dodd-Frank Act, the Federal Reserve also requires the largest bank holding companies to participate in a supervisory annual capital planning exercise, the CCAR. These institutions must submit an annual capital plan to the Federal Reserve detailing their expected uses and sources of capital, including plans to make dividends and stock repurchases and information about their internal processes for evaluating their capital adequacy. An institution may not make capital distributions if the Federal Reserve has not approved its capital plan.⁴⁹

The Federal Reserve has tailored its application of the supervisory stress test requirements and CCAR for institutions that have less than \$250 billion in total consolidated assets and less than \$10 billion in foreign exposures and provided guidance as to its heightened expectations for institutions above those thresholds.⁵⁰

In its report on the 2015 CCAR, the Federal Reserve noted that the common equity tier 1 capital ratio of the 31 bank holding companies in the 2015 CCAR has more than doubled from 5.5 percent in the first quarter of 2009 to 12.5 percent in the fourth quarter of 2014, reflecting an increase in common equity capital of more than \$641 billion, to \$1.1 trillion.⁵¹

Enhanced Stress Test Requirements

The Federal Reserve has required the very largest institutions to take additional factors into account in conducting their stress tests and capital planning. Specifically, the Federal Reserve has required the six G-SIBs with large trading operations to factor in a global market shock as part of their scenarios and has required the eight G-SIBs, given their substantial trading or custodial operations, to incorporate a counterparty default scenario.⁵²

⁴⁸ 12 C.F.R. Part 252, Subpart E.

⁴⁹ 12 C.F.R. § 225.8.

⁵⁰ See Federal Reserve, SR 15-18, Federal Reserve Supervisory Assessment of Capital Planning and Positions for LISCC Firms and Large and Complex Firms (Dec. 18, 2015); Federal Reserve, SR 15-19, Federal Reserve Supervisory Assessment of Capital Planning and Positions for Large and Noncomplex Firms (Dec. 18, 2015).

⁵¹ Federal Reserve, Comprehensive Capital Analysis and Review 2015: Assessment Framework and Results (March 2015), p. 2, *available at* <http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20150311a1.pdf>.

⁵² See Federal Reserve, 2015 Supervisory Scenarios for Annual Stress Tests Required under the Dodd-Frank Act Stress Testing Rules and the Capital Plan Rule (Oct. 23, 2014), *available at* <http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20141023a1.pdf>.

Based on CCAR results released in March 2015, the six largest U.S. G-SIBs were projected to be able to absorb more than \$350 billion in losses over a severely adverse financial and economic scenario while still growing assets and distributing capital. Of this total loss amount, about \$100 billion is attributed to elements of the stress test that are only applicable to G-SIBs, namely, the projected stress from trading operations and the failure of each G-SIB's largest counterparty.⁵³

In finalizing the G-SIB capital surcharge rule, the Federal Reserve noted that it was assessing a wide range of possible changes to the CCAR process, including better addressing risks arising from correlations in the exposures and activities of large financial institutions, and whether and, if so, how, to incorporate G-SIB capital surcharges into the post-stress minimum capital required under the CCAR process.⁵⁴

Liquidity and Capital Requirements

In 2014, the Federal Reserve, OCC, and FDIC adopted a standardized minimum liquidity requirement for (1) bank holding companies, savings and loan holding companies, and depository institutions with \$250 billion in consolidated total assets or \$10 billion or more in consolidated total on-balance sheet foreign exposures and (2) their subsidiary depository institutions with \$10 billion or more of total consolidated assets. The rule requires these institutions to hold high-quality liquid assets in an amount equal to or greater than the projected cash outflows over a 30-day period of stressed liquidity conditions (the ratio between these assets and cash outflows being the LCR). The Federal Reserve also adopted a modified 21-day LCR requirement for bank holding companies and savings and loan holding companies with assets of at least \$50 billion. In adopting the rule, the agencies explained that it is “designed to promote the short-term resilience of the liquidity risk profile of large and internationally active banking organizations, thereby improving the banking sector’s ability to absorb shocks arising from financial and economic stress, and to further improve the measurement and management of liquidity risk.”⁵⁵ The Federal Reserve recently proposed a rule that would require bank holding companies to publicly disclose information regarding their LCR calculations.⁵⁶ The LCR requirement supplements the extensive guidance the agencies have provided with respect to

⁵³ See Federal Reserve, Dodd-Frank Act Stress Test 2015: Supervisory Stress Test Methodology and Results (March 2015), p. 22 (Table 4), available at <http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20150305a1.pdf>.

⁵⁴ Federal Reserve Board Governor Daniel K. Tarullo Opening Statement (July 20, 2015), available at <http://www.federalreserve.gov/newsevents/press/bcreg/tarullo-statement-20150720a2.htm>.

⁵⁵ Federal Reserve, OCC, and FDIC, Liquidity Coverage Ratio: Liquidity Risk Measurement Standards, 79 Fed. Reg. 61440 (Oct. 10, 2014).

⁵⁶ Federal Reserve, Liquidity Coverage Ratio: Public Disclosure Requirements, 80 Fed. Reg. 75010 (Dec. 1, 2015).

proper liquidity risk management practices. G-SIBs in particular may be required to maintain additional liquidity pursuant to this guidance and the stress test framework discussed above.

The recently adopted capital requirements applicable to the G-SIBs are discussed above in Section A. These requirements supplement the generally applicable capital requirements that have been revised by the Federal Reserve, OCC, and FDIC to implement the Basel III capital standards and changes required by the Dodd-Frank Act.

Finally, capital standards for nonbank financial companies designated by the Council for Federal Reserve supervision continue to progress. In July 2015, the Federal Reserve issued a final order that established enhanced prudential standards for GECC. They require GECC to comply with enhanced prudential standards that become effective in two stages. First, on January 1, 2016, GECC was required to comply with risk-based and leverage capital requirements, the LCR rule, and related reporting requirements. Second, beginning on January 1, 2018, GECC is required to comply with liquidity risk management, general risk management, capital-planning, and stress testing requirements, as well as restrictions on intercompany transactions. Additionally, GECC will also be subject to certain governance requirements unique to its structure.⁵⁷ In 2014, Congress enacted the Insurance Capital Standards Clarification Act of 2014, which clarified the Federal Reserve's authority when constructing capital standards for insurance firms designated by the Council for Federal Reserve supervision. Three nonbank financial companies with significant insurance activities have been designated by the Council: American International Group, Inc., Prudential Financial, Inc., and MetLife, Inc.

Summary

The U.S. regulatory stress testing framework that has been further developed since 2011 allows for a dynamic evolution in the stress testing process along with some diversity and tailoring in stress testing practices. Stress tests are conducted by both firms and supervisors, with multiple sets of scenarios considered and differences in stringency based upon a firm's size and complexity. Moreover, since the stress test and capital plan requirements were first implemented, the Federal Reserve has continually refined its approach and has imposed enhanced requirements on the very largest bank holding companies, reflecting the additional risks to the financial system and economy that a failure of those institutions would pose.⁵⁸

⁵⁷ Federal Reserve, Application of Enhanced Prudential Standards and Reporting Requirements to General Electric Capital Corporation, 80 Fed. Reg. 44111 (Jul. 24, 2015).

⁵⁸ See, e.g., Daniel K. Tarullo, Stress Testing after Five Years, Remarks at the Federal Reserve Third Annual Stress Test Modeling Symposium, Boston, Massachusetts (June 25, 2014), available at <http://www.federalreserve.gov/newsevents/speech/tarullo20140625a.htm>.

Further monitoring of the implementation of the recently adopted capital and liquidity rules will likewise provide a better understanding of the effects of those requirements.

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